ADVERTISEMENT SPECIFICATIONS

PROPOSAL CONTRACT AND BOND

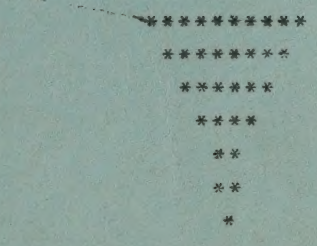
FOR

CONSTRUCTING SEWER EXTENSIONS, ELEVATED TANK

AND

REFUSE INCENERATOR

THE CITY OF ATHENS, GEORGIA



P. W. A. DOCKET, GA. 1484 - F

Contract No. 2

J. G. Beacham, City Engineer

WIEDEMAN AND SINGLETON

CONSULTING ENGINEERS

ADVERTISEMENT SPECIFICATIONS

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ADVERTISEMENT FOR BIDS

Sealed proposals will be received by the Mayor and Council of the City of Athens, Georgia, at the City Hall until Twelve o'clock Noon, E. S. T., February 20, for constructing Sewer Extensions, Elevated Tank and Refuse Incinerator, at which time and place they will be publicly opened and read. Separate bids will be received on each item.

Specifications and contract documents are open to public inspection at the City Hall at Athens, Georgia, or may be obtained from Wiedeman and Singleton, Engineers, at 1404 Candler Building, Atlanta, Georgia, upon deposit of Fifteen ($15.00) Dollars. The full amount of the deposit for one set of documents will be returned to each actual Bidder and all other deposits will be refunded, less Seven and one half ($7.50) Dollars, upon return of all documents in good condition within 30 days after the date of opening of bids.

Bids must be accompanied by a certified check or bid bond in an amount equal to five (5%) per cent of the bid.

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of thirty (30) days.

The Owner reserves the right to reject any or all bids and to waive informalities.

(Signed) THE MAYOR AND COUNCIL OF
THE CITY OF ATHENS, GEORGIA

By A. C. DUDLEY
Mayor

SECTION 1

INSTRUCTIONS TO BIDDERS

1.01 How Let: The work will be let in three divisions, and contractors bidding on any divisions must bid on the complete work specified for that division.

Division one will consist of sewer extensions and tank foundations including altitude valves and miscellaneous piping. Contract for this division will be let on a lump sum basis.

Division two will consist of a 250,000 gallon capacity elevated tank, erected, but not including foundation. Contract will be let on a lump sum basis.

Division three will consist of a refuse incinerator of 75 tons capacity per 24 hours. Contract will be let on a lump sum basis. All contracts will be awarded to the lowest and best bidder. No contract will be let for less than one division.

1.02 Blanks: All bids must be made upon the blanks hereto annexed and shall state, in figures and in writing, the amount bid for each item as shown, and all proposals must be for materials and work called for in the specifications.

1.03 Bids: The bids are to be enclosed in a sealed envelope addressed to the Mayor, A. G. Dudley, Athens, Georgia, and marked "Proposals for Constructing Sewer Extensions, Elevated Tank or Refuse Incinerator."

1.04 Certified Check or Bidders Bond: Each bid must be accompanied by a certified check, or bidders bond, for an amount equal to five (5%) per cent of the amount of the bid, to guarantee that the successful bidder will, within ten (10) days from the date of notice of award of contract, enter into a contract with the Mayor and Council of the City of Athens, hereinafter known as the Owner, for the performance of the work and execute a satisfactory surety bond in an amount equal to one hundred (100%) per cent of the contract price, as provided in Paragraph 1.05 hereof. The proceeds of such checks or bidders bonds are to become the property of the Owner as liquidated damages, if, for any reason whatever, the bidder withdraws from the competition within 10 days after opening of the bids, or refuses to execute the required contract and bond if his bid is accepted.

1.05 Contract Security or Performance Bond: The Contractor shall furnish a surety bond executed by a surety company duly authorized to do business in the State of GEORGIA in an amount at least equal to 100 per cent of the contract price, as security for the faithful performance of this contract and as security for the payment of all persons performing labor and furnishing materials in connection with this contract.

1.06 Return of Checks: All checks or bidders bonds except those of the three lowest bidders will be returned within 10 days. All remaining checks, or bidders bonds, will be returned after the approval of the contract and bond executed by the successful bidder.

1.07 Bids opened in Public: Bids will be opened in public at the time of the letting. Bidders and the public are invited to be present.

1.08 Right to Reject Bids: The Owner reserves the right to reject any or all bids, and to waive informalities. It is distinctly understood, and all bids are made subject to this agreement, that the Owner reserves the right to decide which bid be deemed lowest and best, and, in arriving at this decision, due consideration will be given to the reputation of the bidder, his financial responsibility, work of this type successfully completed, and the character of material and machinery offered. No bids received after time set for opening proposals will be considered. Any unauthorized conditions, limitations, or provisos, attached to the proposal, or the omission of a bid on any item in the proposal for the section bid upon, will render it informal and may cause its rejection.

No bids will be allowed to be withdrawn after time set for receiving bids. Unbalanced bids will be subject to rejection.

1.09 Proposal: The sum bid for each division or item shall be for furnishing all equipment, materials and labor for completing the division or item, as per plans and specifications.

Should it be found that quantities or amounts shown on the plans or in the proposal, for any part of the work, are exceeded or should they be found to be less after the actual construction of the work, the amount bid for each division or item will be increased or decreased in direct proportion to the change in quantities or amounts, at the unit prices bid for the listed individual items.

1.10 License and Royalty Fee: The Contractor shall assume all liability for license or royalty fees, due to the use of any construction or operation process which is protected by patent rights. The amount of the license or royalty fee, if any, shall be stated by the Contractor.

1.11 Insurance, Contractor's Coverage: The Contractor shall not commence work under this contract until he has obtained all insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been so obtained and approved.

1.12 Insurance, Compensation: The Contractor shall take out and maintain during the life of this contract Workmen's Compensation Insurance for

all of his employees employed at the site of the project and, in case any work is sublet, the Contractor shall require the Subcontractor similarly to provide Workmen's Compensation Insurance for all the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this contract at the site of the project is not protected under the Workmen's Compensation statute, the Contractor shall provide, and shall cause each Subcontractor to provide adequate coverage for the protection of his employees not otherwise protected.

1.13 Insurance, Public Liability and Property Damage: The Contractor shall take out and maintain during the life of this contract such Public Liability and Property Damage Insurance as shall protect him and any Subcontractor performing work covered by this contract, from claims for damage for personal injury, including accidental death, as well as from claims for property damages, which may arise from operations under this contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:

> Public Liability Insurance in an amount not less than $10,000.00 for injuries, including accidental death, to any one person, and, subject to the same limit for each person, in an amount not less than $20,000.00, on account of one accident, and Property Damage Insurance in an amount not less than $10,000.00

1.14 Insurance, Proof of Carriage: The Contractor shall furnish the Owner with satisfactory proof of carriage of the insurance required.

1.15 Employment, Qualifications: No person under the age of sixteen (16) years, and no convict labor shall be employed to perform any work under this contract. No person whose age or physical condition is such as to

make his employment dangerous to his health or safety or to the health and safety of others shall be employed to perform any work under this contract: Provided, that this shall not operate against the employment of physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform. There shall be no discrimination because of race, creed, color or political affiliations, in the employment of persons for work under this contract. All employees engaged in work under this contract, shall have the right to organize and bargain collectively through representatives of their own choosing, and such employees shall be free from interference, restraint, and coercion of employers in the designation of such employee's representatives, in self-organization, and in other concerted activities of such employees, for the purpose of collective bargaining or other mutual aid or protection, and no person seeking employment under this contract and no person employed under this contract shall be required as a condition of initial or continued employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of such person's own choosing.

1.16 Employment Services and Labor Preferences: With respect to all skilled, semi-skilled, and unskilled workers employed to perform work on the project:

(a) Preference in employment shall be given to persons from the public relief rolls where such workers are available and qualified to perform the work to which the employment relates, and

(b) To the fullest extent possible labor required for the project and appropriate to be secured through employment services shall be chosen from the list of

qualified workers submitted by local employment agencies designated by the United States Employment Service: Provided, however, that union labor, skilled, semi-skilled, and unskilled, shall not be required to register at such local employment agencies but, if such labor is desired by the employer, shall be secured in the customary ways through union locals. In the event, however, that employers who wish to employ union labor are not furnished with qualified workers by the union locals which are authorized to furnish such labor within 48 hours (Sundays and holidays excluded) after request is filed by the Employer, all labor shall be chosen from lists of qualified workers submitted by local agencies designated by the United States Employment Service.

1.17 Nondiscrimination: Except as specifically provided, workers who are qualified by training and experience and who, as above outlined, are referred for work on the project, shall not be discriminated against on any grounds whatsoever.

1.18 Hours of Work: Except in

(a) Emergencies, which are defined as unforseen occurrences and combinations of circumstances involving the public welfare or the protection of work already done under this contract or which endanger life or property and call for immediate action or remedy; or

(b) Special and unusual circumstances rendering it infeasible or impracticable to require adherence to the applicable limitations of hours herein set forth, skilled, semi-skilled, and unskilled laborers employed upon the project under this contract shall not be permitted to work

thereon more than eight (8) hours per day nor more than forty (40) hours per week; provided, however, that the limitations of hours set forth in this paragraph shall not apply to executive, supervisory and administrative employees as such.

1.19 Wage Rates: There shall be paid each employee engaged in work under this contract at the site of the project in the trade or occupation listed below, not less than the wage rate set opposite the same, namely:

1.20

Trade or Occupation BUILDING CONSTRUCTION	Wage Rate
Bricklayers	$ 1.25
Cement finishers-building work	1.00
Electrical Workers	1.25
Carpenters	1.00
Glaziers	1.00
Hoisting Engineer (1 drum)	.70
Hoisting Engineer (2 drum)	1.00
Iron workers-Structural	1.25
Iron workers-Rodmen	1.00
Marble Setters	1.25
Mosaic & Terrazzo Workers	1.25
Marble Helpers	.70
Terrazzo Helpers	.70
Tile Setters	1.25
Tile Setters helpers	.70
Painters-Paper Hangers-Decorators	1.00
Plasterers	1.25
Plumbers	1.25
Plumbers helpers	.70
Roofers-Slate & Tile	1.00
Roofers-Composition	.60
Kettlemen	.70
Sheet Metal Workers	1.00
Steam Fitters-Pipe Fitters	1.25
Steam Fitters Helpers	.70
Stone Cutters	1.00
Stone Masons	1.25
Waterproofers	1.00
Welders-Arc and Acetylene	1.00
Welders-Burners-Cutters	1.00
Truck Drivers 1-1/2 ton & under	.50
Laborers-Common	.40

Trade or Occupation HEAVY CONSTRUCTION	Wage Rate
Blacksmith	$ .75
Blacksmith Helpers	.40
Blaster & Powdermen	.75
Bricklayers-Sewer manhole	1.00
Bricklayers-Tenders	.40
Carpenters	1.00
Caulkers-Pipe-Yarners	.50
Cement Finishers-Paving	.75
Steel Tank erectors	1.00
Iron workers-Struct	1.25
Iron workers-Reinf. (1 per gang laborers)	1.00
Kettlemen	.70
Mechanic-Repairmen-Machinery erector	1.00
Operator-Bulldozer	.70
Operator-Shovel	1.00
Operator-Crane-Dragline-Clamshell	1.00
Operator-Ditcher-Trench Mach.	1.00
Operator Jackhammer	.70
Operator Mixers 10-S; 10-E or smaller	.70
Operator Pumps-power	.70
Operator Rollers	1.00
Operator Tractors	.70
Operator Trucks over 1-1/2 tons	.70
Pipe layers-Sewer & water	.50
Pipe handlers	.40
Reinforcement placers	.40
Laborers	.40

1.21 Posting Minimum Wage Rates: The Contractor shall post at appropriate conspicuous points on the site of the project a schedule showing all determined wage rates and all authorized deductions, if any, from unpaid wages actually earned.

1.22 Classification of Labor, Claims and Disputes pertaining to: Claims and disputes pertaining to the classification of labor employed under this contract shall be decided by the Owner: Provided, That if the parties to the dispute so agree and if the Owner also agrees, the parties concerned may submit such claims and disputes to the Administrator who may, in his discretion, refer said claims and disputes to the Board of Labor Review of the Federal Emergency Administration of Public Works for decision.

1.23 Payment of Employees: The Contractor and each of his Subcontractors shall pay each of his employees engaged in work on the project in full (less deductions made mandatory by law) in cash and not less often than once each week.

1.24 Materials, Convict-Made: No materials manufactured or produced in a penal or correctional institution shall be incorporated in the project under this contract.

1.25 Materials, Domestic and Foreign: Only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States of America, and only such manufactured articles, materials, and supplies as have been manufactured in the United States of American substantially all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States of America, shall be employed under this contract in the construction of the project.

1.26 Accident Prevention: Precaution shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment, and other hazards shall be guarded in accordance with the safety provisions of the Manual of Accident Prevention of Construction, published by the Associated General Contractors of America,

to the extent that such provisions are not in contravention of applicable law.

1.27 Inspection: The Federal Emergency Administrator of Public Works, his authorized representatives and agents, shall be permitted to inspect all work, materials, pay rolls, records of personnel, invoices of materials, and other relevant data and records.

1.28 Reports, Construction: The Contractor shall submit to the Owner schedules of costs and quantities of materials and of other items, which schedules shall be in such form and shall be supported as to correctness by such of the estimates upon which they are based as the Owner may require. The Contractor shall also submit to the Owner the following records on forms to be supplied by the Owner:

(a) Detailed Estimate

(b) Periodical Estimates for Partial Payment.

1.29 Reports to U. S. Department of Labor: The Contractor shall furnish to the United States Department of Labor, as early as practicable, the names and addresses of all of his Subcontractors. The Contractor and each of his Subcontractors shall report monthly to said Department, not later than the fifth day following the close of each calendar month, on forms and in accordance with instructions to be supplied by the Owner, the number of persons directly employed under his contract who, during the particular calendar month, were on his pay rolls, the aggregate amount of each of said pay rolls, the man-hours worked, and the total expenditures for materials, which expenditures shall be itemized.

1.30 Reports to the Owner: The Contractor shall report monthly directly to the Owner not later than the fifth day following the close of each calendar month, on forms and in accordance with instructions to be sup-

plied by the Owner, the total number of persons who were directly employed under his contract during the particular calendar month.

1.31 Pay Rolls of Contractors and Subcontractors: The Contractor and each of his Subcontractors shall prepare his pay rolls on forms prescribed and in accordance with instructions to be furnished by the Owner. Not later than the 7th day following the payment of wages, each such Contractor shall transmit to the Owner a certified legible copy and two conformed copies of each such pay roll. Each such pay roll shall be sworn to in accordance with the "Regulations Issued Pursuant to the So-Called Kick-Back Statute", which regulations are herein elsewhere set forth. The Contractor and each of his Subcontractors shall submit reports on forms as and when required by the Owner, covering the purchases of and requisitions for materials, together with such other information as may be required to determine the progress and status of work under this contract.

1.32 Project Date and Records: Promptly following the preparation of periodical pay rolls of the Contractor and each of his Subcontractors, the Contractor shall furnish the Owner with such number of certified copies thereof, accompanied by such substantial proof that all pay rolls for services rendered and materials supplied have been duly paid as herein required and by such other data as the Owner may require.

1.33 Payment: (a) Not later than the 15th day of each calendar month the Owner will make partial payment to the Contractor on the basis of duly certified approved estimate of the work performed during the preceding calendar month by the Contractor, but the Owner will retain not less than 10 per cent of the amount of each such estimate until final completion and acceptance of all work covered by this contract.

(b) The Contractor shall pay (1) for all transportation and utility services not later than the 20th day of the calendar month following that in which such services are rendered, (2) for all materials, tools, and other expendable equipment to the extent of 90 per cent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (3) to each of his Subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his Subcontractors, to the extent of each such Subcontractor's interest therein.

1.34 Kick-Back Statute and Regulations, Compliance with: The Contractor and each of his Subcontractors shall comply with the following statute and regulations issued pursuant thereto:

KICK-BACK STATUTE AND REGULATIONS

Kick-Back Statute: The so-called Kick-Back Statute is Public #324, Seventy-Third Congress, approved June 13, 1934 (48 Statute #948), and reads as follows:

> AN ACT to effectuate the purpose of certain statutes concerning rates of pay for labor, by making it unlawful to prevent anyone from receiving the compensation contracted for thereunder, and for other purposes.
>
> BE IT ENACTED by the Senate and House of Representatives of the United States of America in Congress assembled,

That whoever shall induce any person employed in the construction, prosecution, or completion of any public building, public work, or building or work financed in whole or in part by loans or grants from the United States, or in the repair thereof to give up any part of the compensation to which he is entitled under his contract of employment, by force, intimidation, threat of procuring dismissal from such employment, or by any other manner whatsoever, shall be fined not more than $5,000. or imprisoned not more than five years, or both.

Sec. 2. To aid in the enforcement of the above section, the Secretary of the Treasury and the Secretary of the Interior jointly shall make reasonable regulations for Contractors or Subcontractors on any such building or work, including a provision that each Contractor and Subcontractor shall furnish weekly a sworn affidavit with respect to the wages paid each employee during the preceding week.

1.35 Kick-Back Statute, Regulations Issued Pursuant to: Pursuant to the provisions of Public No. 324, Seventy-Third Congress, approved June 13, 1934 (48 Statute #948), concerning rates of pay for labor, the Secretary of the Treasury and the Secretary of the Interior have jointly made the following regulations:

Section 1. (This Section quotes the Kick-Back Statute).

Section 2. Each Contractor and Subcontractor engaged in the construction, prosecution, or completion of any building or work of the United States or in part by

loans or grants from the United States, or in the repair thereof, shall furnish each week an affidavit with respect to the wages paid each employee during the proceding week. Said Affidavit shall be in the following form:

State of _____,

County of _____, as:

I, _____(name the party signing affidavit), _____(title), do hereby certify that I am the employee of _____ _____(Name of Contractor or Subcontractor), who supervised the payment of the employees of said Contractor (Subcontractor): that the attached pay roll is a true and accurate report of the full weekly wages due and paid to each person employed by the said Contractor (Subcontractor) for the construction of _____ _____(project), for the weekly pay roll period from the _____ day of _____, 193__, to the _____ day of _____, 193__; that no rebates or deductions from any wages due any such person as set out on the attached pay roll have been directly or indirectly made; and that, to the best of my knowledge and belief, there exists no agreement or understanding with any person employed on the project, or any person whatsoever, pursuant to which it is contemplated that I or anyone else shall, directly or indirectly, by force intimidation, threat or otherwise, induce or receive any deductions or rebates in any manner whatsoever from any sum paid or to be paid

to any person at any time for labor performed or to be performed under the contract for the above named project.

Sworn to before me this _____ day of _____, 193 ____.

Section 3. Said affidavit shall be executed and sworn to by the officer or employee of the Contractor or Subcontractor who supervises the payment of its employees. Said affidavit shall be delivered within seven days after the payment of the pay roll to which it is attached, to the Government representative in charge at the site of the particular project in respect of which it is furnished, who shall forward the same promptly to the Federal Agency having control of such project. If no Government representative is in charge at the site, such affidavit shall be mailed within such seven-day period to the Federal Agency having control of the project.

Section 4. At the time upon which the first affidavit with respect to the wages paid to employees is required to be filed by a Contractor or Subcontractor pursuant to the requirements of these regulations, there shall also be filed in the manner required by Section 3 hereof a statement under oath by the Contractor or Subcontractor, setting forth the name of its officer or employee who supervises the payment of employees, and that such officer or employee is in a position to have full knowledge of the facts set forth in the form of affidavit required

by Section 2 hereof. A similar affidavit shall be immediately filed in the event of a change in the officer or employee who supervises the payment of employees. In the event that the Contractor or Subcontractor is a corporation, such affidavit shall be executed by its president or a vice-president. In the event that the Contractor or Subcontractor is a partnership, such affidavit shall be executed by a member of the firm.

Section 5. These regulations shall be made a part of each contract executed after the effective date hereof by the Government for any of the purposes enumerated in Section 2 hereof.

Section 6. These regulations shall become effective on January 15, 1935.

1.36 Interpretation of Regulations: The clause in the pay roll affidavit which reads ". . . that the attached pay roll is a true and accurate report of the full weekly wages due and paid to each person employed by the said Contractor . . ." is construed to mean:

(a) Wages due are the wages earned during the pay period by each person employed by the Contractor, less any deductions required by law.

(b) At the time of signing the affidavit, the wages due each employee have either been paid to him in full or are being held subject to claim by him.

(c) Such unpaid wages will be paid in full on demand of the employee entitled to receive them. The clause ". . . that no rebates or deductions from any wages due any such

person as set out on the attached pay roll have been directly or indirectly made" does not apply to any legitimate deductions mentioned above which enter into the computation of fully weekly wages due.

The "Regulations Issued Pursuant to So-Called Kick-Back Statute" shall not be construed to prohibit deductions required by law.

1.37 Definitions: The following terms as used in this contract are respectively defined as follows:

(a) "Subcontractor" - A person, firm or corporation supplying labor and materials or labor for work at the site of the project:

(b) "Work at Site of Project" - Work to be performed, including work normally done, at the location of the project.

1.38 Signs: The Contractor shall furnish, erect and maintain on the site of the job at points to be designated, signs of a size mentioned elsewhere in these documents, which signs will bear the legend:

P. W. A.

FEDERAL EMERGENCY
ADMINISTRATION OF PUBLIC WORKS

SEWER, WATER WORKS AND INCINERATOR

Project No. GA. 1484-F

The Contractor shall provide, erect and maintain upon the site of the project and in positions to be designated by the Owner two

(2) signs 4' 6"x7' 6" substantially built of wood in accordance with the detail attached. The entire woodwork of each sign shall be given a lead and oil prime coat and two coats of white lead and oil paint. The lettering as detailed shall be done in black sign paint by a professional sign painter.

The Contractor shall protect the signs from injury during the continance of his work and shall do all patching of lettering, painting and placing thereof necessary to maintain them in first class condition in proper position.

1.39 Commencement and Completion of Work: The Contractor shall commence work under his contract on a date to be specified in a written order of the Engineer and shall fully complete all work thereunder within 135 consecutive calendar days from and including said date.

The 135 calendar days specified above is to be construed as the maximum time established by the Owner for completion of this contract; however, such establishment of the number of days for completion does not restrict bidders from stating in the proposals, in the space provided therefor, the number of calendar days in which they agree to complete the contract. Bidders are notified that proposals offering to complete this contract in excess of the number of days established by the Owner shall be deemed irregular and will not be subject for consideration of award.

1.40 Interpretation of Contract Documents: If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the specifications or other proposed contract documents, he may submit to the Engineer a written request for interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by Addendum duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of such documents. The owner will not be responsible for any other explanations or interpretations of the proposed documents.

1.41 Resident Engineer Inspectors Office: Resident Engineer Inspector's office will be furnished by the Owner.

1.42 Conflicts and Inconsistences: The above and foregoing paragraphs or provisions included in section 1 - Instructions to Bidders, shall govern and control any and all conflicting or inconsistent paragraphs or provisions elsewhere in any of these documents, and such conflicting or inconsistent paragraphs or provisions shall be void to the extent of such conflict or inconsistency. No part of this contract shall be sublet without the written consent of the Owner.

ADDENDA TO PRECEDING PARAGRAPHS

1.11 Insurance, Contractor's Coverage: If a subcontractor does not take out insurance in his own name and his principal contractor wishes to provide insurance protection for such subcontractor and such subcontractor's employees, a rider must be attached to the principal contractor's policy, which rider must identify the persons thereby covered, or else the principal contractor must take out appropriate policies in the name of the subcontractor. The instructions are not retro-active to insurance heretofore approved.

1.31 Payrolls of Contractors and Subcontractors: A contractor or subcontractor must not carry on his payroll any person not employed by him. A contractor must not carry on his payroll employees of a subcontractor, but such employees must be carried only on the payrolls of the employing subcontractor.

Brands: The name of a certain brand, make, manufacture or definitive specification is to denote the quality standard of the article desired, but does not restrict bidders to the specific brand make, manufacture or specifications named; it is to set forth and convey to bidders the general style, type, character and quality of the article desired.

SECTION NO. 2

GENERAL CONDITIONS

2.01 Intention: It is intended that these specifications shall cover the completion of the work to which they relate.

2.02 Definitions: Where the following words, or the pronouns used in their stead, occur in these specifications, they shall have the following meaning:

2.03 Owner: Owner shall mean the MAYOR AND COUNCIL OF THE CITY OF ATHENS or their authorized and legal representatives.

2.04 Engineer: Engineer shall mean Wiedeman and Singleton, Consulting Engineers of Atlanta, Georgia, acting for the Owner or their duly authorized representatives.

2.05 Contractor: The party of the first part to the foregoing agreement or the legal authorized representatives of such party.

2.06 Changes in Quantities: The quantities of materials and equipment indicated on the plans or specified are to be used as the basis for a lump sum proposal.

In the event that the quantities are increased, the Contractor will be paid for such additional quantities at the prices bid for such work. If quantities are decreased, a deduction will be made in the same manner.

2.07 Plans: The character and location of the work, together with the essential details, are shown upon a set of drawings numbered 1 to 16 inclusive. These drawings and specifications form a part of this contract. The approved plans will be supplemented by such working drawings as are necessary. All authorized alterations affecting the requirements and information given on the approved plans shall be in writing.

2.08 Working Drawings: Working drawings for any structure shall consist of such detailed plans as may be required for the prosecution of the work but are not included in the plans, all necessary working drawings shall be furnished by Contractor. They shall include shop details, erection plans, masonry layout diagrams and bending diagrams for reinforcing steel, approval of which by the Engineer must be obtained before any work involving these plans may be performed. Plans for false-work, centering and form work may also be required, and such cases shall be likewise subject to approval by the Engineer.

It is expressly understood, however, that approval by the Engineer of the Contractor's working drawings does not relieve the Contractor of any responsibility for accuracy of dimensions and details. The Contractor shall be responsible for agreement and conformity of his working drawings with the Plans and Specifications.

The contract price shall include the cost of furnishing all working drawings and the Contractor will be allowed no extra compensation for such drawings.

2.09 Work to be done: The Contractor shall furnish all equipment except that specified to be furnished by the Owner and all material, labor, sppliances and tools necessary to complete the work awarded to him in accordance with the contract drawings. Should the Owner deem it necessary to modify the location, grade, number or size of structures and appurtenances, it reserves the right to do so, and the Contractor shall accept such modifications so ordered in writing. When any such changes are made, the Contractor shall receive compensation, based upon the schedule of prices submitted and accepted in the proposal.

In no case will any work not called for in the original contract and plans be paid for, unless so ordered in writing by the Engineer.

2.10 Coordination of Plans, Specifications, etc: These Specifications, the Plans, and all supplementary documents are essential parts of the Contract, and requirements occurring in one is as binding as though occurring in all. They are intended to be cooperative to describe and provide for a complete work. In case of discrepancy, figured dimensions shall govern.

2.11 Cooperation of Contractor: The Contractor will be supplied with two (2) copies of the Plans and Specifications. The Contractor shall have available on the work, at all times, one (1) copy of each of said plans and specifications. He shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Engineer and with other Contractors in every way possible. The Contractor shall at all times have a Superintendent, satisfactory to the Engineer, capable of acting as his agent on the work, who shall receive instructions from the Engineer or his authorized representatives. The Superintendent shall have full authority to execute tho orders or directions of the Engineer without delay and to promptly supply such materials, tools, plant equipment and labor as may be required.

2.12 Construction Stakes: The Engineer will furnish and lay out upon the ground a sufficient number of controlling lines and will establish bench marks in convenient locations near the work to enable the Contractor to lay out the necessary construction lines. All subsequent subsidiary lines and grades shall be laid out by the Contractor from the controlling lines and bench marks furnished by the Engineer or from measurements shown on the drawings. All lines and grades shall be subject to checking by the Engineer, but this checking shall in no wise relieve the Contractor from responsibility for their correctness.

The Contractor shall provide such stakes, materials, and such labor and assistance as the Engineer may require in laying out work, establishing bench marks and checking and measuring the work.

2.13 Authority and Duties of Inspectors: (a) Inspectors shall be authorized to inspect all work done and all material furnished, including preparation, fabrication, and manufacture of the materials to be used. The Inspector shall not be authorized to alter or waive any requirement of the Specifications. He shall call the attention of the Contractor to any failure of the work or materials to conform to the Specifications and Contract. He may reject materials or suspend the work until any questions at issue can be referred to and decided by the Engineer. The presence of the Inspector shall in no wise lessen the responsibility of the Contractor.

2.14 Inspection: The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work performed and materials used are in accordance with the requirements and intent of the Specifications and Contract. No work shall be done or materials used without suitable supervision or inspection by the Engineer or his representative. Failure to reject any defective work or materials shall not in any way prevent later rejection when such defect be discovered, or obligate the Owner to final acceptance.

All material furnished and work done when not in accordance with the specifications and contract, will be rejected and shall immediately be removed and other work done and materials furnished in accordance therewith. If the Contractor fails to remove the work and material as above ordered, within forty-eight hours, then the Engineer shall have the right and authority to stop the Contractor and his work at once and

to supply men and material at the cost and expense of the Contractor.

2.15 Maintenance: The Contractor will be required to maintain all work in a first-class condition for a thirty (30) days operating period after same has been completed as a whole and the Engineer has notified the Contractor in writing that the work has been finished to his satisfaction. The retained percentage will not be due or payable to the Contractor until after the thirty (30) day operating period has expired.

2.16 Defective Work and Material: The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill his contract and defective work shall be made good, notwithstanding that such work and materials have been previously inspected by the Engineer and accepted or estimated for payment. The failure of the Engineer to condemn improper materials or workmanship shall not be considered as a waiver of any defect which may be discovered later, or as preventing the Owner at any time sub-sequently from recovering damages for work actually defective.

2.17 Corrections: Should any portions of the plans and specifications be obscure or in dispute, they shall be referred to the Engineer and he shall decide as to the true meaning and intent. He shall also have the right to correct any errors or omissions at any time when such correction are necessary for the proper fulfillment of said plans and specifications.

2.18 Disagreement: Should any disagreement or difference arise as to the estimate, quantities or classifications or as to the meaning of the drawings or specifications, on any point concerning the character, acceptability and nature of the several kinds of work, and materials and construction thereof, the decision of the Engineer shall be final and

conclusive and binding upon all parties to the contract.

2.19 Weather: During unseasonable weather all work must stop when the Engineer so directs and all work must be suitably protected.

2.20 Extra Work: No extra work will be paid for unless the same was done upon the written order of the Engineer. Extra work will be paid for according to the prices in the proposal schedule. Where prices for work are not included in the schedule, ten (10%) per cent advance upon the actual cost of labor and materials, not including overhead, as determined by the Engineer, will be paid to the Contractor limited to a previously estimated total. All bills for extra work must be submitted on the first of the month following the completion of same.

2.21 Estimates: The Engineer, during the first week of each month, shall make an approximate estimate of the value of the work done and of the materials delivered and properly stored on the site of the work during the previous month, but not yet incorporated in the work, and the Contractor will be paid an amount equal to ninety (90%) per cent of such value on or before the fifteenth (15th) of the month. The balance will be retained by the Owner until completion of the 30-day maintenance period and final acceptance by the Engineer.

2.22 Right-of-Way: The necessary land for the construction of the work will be furnished by the Owner, and a definite area will be allocated to the Contractor for storage of material and equipment used in the construction of the work. All operations shall be confined to the assigned area.

The Owner will provide no right-of-way over other property. The Contractor shall take every possible precaution to inconvenience as little as possible the owners or tenants of adjacent property. Public Highways shall not be obstructed in such a way as to cut off traffic.

The Contractor shall at his own expense, repair any damage or injury to either public or private property during the progress of the work.

2.23 Sub-Contract: No part of the work shall be sub-let without the written consent of the Owner. If such consent is obtained and any part of the work is sub-let, this action shall not relieve the Contractor from any part of his obligations under his contract. The sub-contractor shall be bound by all requirements applying to the Contractor. The Owner shall have the right at any time to terminate said sub-contract, if the Engineer certifies that the sub-contractor has failed to perform the work in a satisfactory manner, in which case the Contractor shall at once complete the work which was sub-let.

2.24 Laws - Construction and Labor: Bidders are required to inform themselves fully of all laws, ordinances and conditions relating to construction and labor under which the work will be performed, and the Contractor must employ, so far as possible, such methods and means in carrying out his work as will not cause any interruption or interference with any other contractors.

2.25 Order of the Work: The prosecution, order or sequence of the work shall be subject to the approval of the Engineer, with approval, however, shall in no way affect the responsibility of the Contractor.

2.26 Abandonment: If the Contractor shall abandon the work, or if at any time the Engineer shall be of opinion, and shall so notify the Owner and the Contractor that the Contractor is wilfully violating any of the conditions of the contract, or executing the same in bad faith, or that the conditions herein specified as to the rate of progress are not fulfilled, or that the work of any part is unnecessarily delayed, or this contract or any claim thereunder is assigned without the written con-

sent of the Owner, or as herein specified, then, at the option of the Owner, the contract may be declared null and void, the security may be forfeited and the materials delivered at and built into the work, and the animals, machinery, implements and tools of every description used for construction at the location of the work may be taken over by the Owner. The Owner may then, at its option, proceed to complete the work, either by day work or contract, and any and all damages and increased costs of the work will be deducted from the funds retained by the Owner, and from any sum realized from the value of the material and equipment reverting to the Owner. If the contract is annulled, as per this provision, the Contractor shall not be entitled to any damages on account thereof, nor shall such an annullment affect the right of the Owner to recover from the Contractor or his bondsmen any additional costs or damages which may arise as to the result of failure of the Contractor to carry out the terms of this contract.

2.27 Labor: The Contractor shall employ only competent and skilled men on the work. The Contractor shall have a competent superintendent or foreman present at all times when the work is in progress with authority to receive orders and execute the work.

The Contractor shall, upon demand from the Engineer, immediately remove any superintendent, foreman or workman whom the Engineer may consider incompetent or undesirable.

2.28 Laws and Regulations: The Contractor shall keep himself fully informed of all laws, ordinances and regulations of State, City and County in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency should

be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same in writing to the Owner. He shall, at all times, himself observe and comply with all such existing and future laws, ordinances and regulations, and shall protect and indemnify the Owner and its agents against any claim or liability arising from or based on the violation of any such law, ordinances, regulation, order or decree, whether by himself or by his employees.

2.29 Assignment: The Contractor shall keep the work under his personal control and shall not assign, by power of attorney or otherwise, the work, or any part thereof without the previous written consent of the Owner, and shall not assign any of the monies payable under the agreement, or his claim thereto, without consent of the Owner.

2.30 Prevention of and Indemnification for Accidents: The Contractor shall during the performance of the work, take all necessary precautions and place proper guards for the prevention of accidents; shall put up and keep at night suitable and sufficient lights and shall indemnify and save harmless the Owner, its officers and agents, from all damages and costs to which they may be put by reason of injury to person or property, resulting from negligence or carelessness in the performance of the work or in guarding the same, or from any improper materials, implements, or appliances used in its construction, or on account of any act or omission of the Contractor, his agents or employees. The whole or as much of the monies due under and by virtue of this contract as may be considered necessary by the Owner shall or may be retained by the Owner until all suits or claims for damages shall have been settled, and evidence to that effect furnished to the satisfaction of the Owner.

2.31 Responsibility of Contractor: The Contractor shall take all responsibility for the work, shall bear all losses resulting to him on account of the amount or character of the work, or because the nature of the land in or on which the work is done is different from what was assumed, or expected, or on account of the weather, floods, or other causes; and he shall assume the defense of, and indemnify and save harmless the Owner, and its officers and agents, from all claims of any kind arising from the performance of this contract.

The Contractor shall have no claim for damages for any injury to the work, materials, or equipment, due to or resulting from the action of the elements, except that in such case the Owner may grant without penalty, an extension of time reasonably sufficient to make proper repairs and to replace work and material which has been destroyed or injured, all of which he shall replace in a satisfactory manner and at his own expense.

The price bid shall include all cost of labor, tools, and material necessary for furnishing protective work, and removing same at the proper time before the final completion of the work, as well as making any repairs that may be necessary.

2.32 Contractor's Claim for Damage: If the Contractor shall claim compensation from the Owner for any damage sustained by reason of the acts of the Owner or its agents, he shall, within five days after the sustaining of such damage, make a written statement to the Owner of the nature of the damage sustained, and its cost.

2.33 Protective Works: The Contractor shall furnish and install all necessary temporary works for the protection of the work.

2.34 Sanitary Regulations: Necessary sanitary convenience for the use of the laborers on the work shall be erected and maintained by the Contractor, in such a manner and at such points as shall be approved by the Engineer.

Their use shall be strictly enforced.

2.35 Shanties: Should the Contractor so desire he may build shanties or other structures for housing men, tools, machinery and supplies, but they will be permitted only at approved places, and their surroundings shall be maintained at all times in a sanitary and satisfactory manner. On or before the completion of the work, all such structures shall be removed, together with all rubbish and trash, at the expense of the Contractor.

2.36 Evidence of Payment: The Contractor shall furnish the Owner, whenever requested, with satisfactory evidence that all persons who have done work, or furnished materials under this agreement have been duly paid or satisfactorily secured. And in case such evidence is not furnished as aforesaid, such amounts as may be necessary to meet the claim of such unsatisfied person may be retained from monies due the Contractor under this contract, until the liabilities aforesaid shall be fully discharged.

2.37 Legal Address: The Contractor shall file with the Owner his legal address, and in the event such address is changed he shall notify the Owner in writing.

The delivery to the Contractor at the last address filed with the Owner by the Contractor, or the deposit in the post office of any notice, letter or other communication to the Contractor so addressed, shall be deemed sufficient service thereof upon the Contractor.

2.38 Liens: Before the final acceptance of the work and payment of the percentage retained by the Owner, the Contractor shall furnish to the Owner proper and satisfactory evidence under oath that all claims for labor and material employed or used in the construction of said work have been settled, and that no legal claims can be filed against the Owner for such labor or material.

2.39 Test: Before the acceptance of the whole or any part of the plant, it shall be subjected to test to determine that it is in accordance with the plans and specifications, and before final acceptance the Owner may operate the completed work for a period of thirty (30) days.

2.40 Cleaning Up: Before the work is considered as complete, all rubbish and unused material due to or connected with the construction must be removed and the premises left in a condition satisfactory to the Owner. Streets, curbs, cross-walks, pavements, sidewalks, fence and other public and private property disturbed or damaged shall be restored to their former condition, and final payment will be withheld until such work is finished.

2.41 Final Inspection: Upon notice from the Contractor that his work is complete, the Engineer shall make a final inspection and shall notify the Contractor of all instances where his work fails to comply with the plans and specifications, as well as any defects he may discover. The Contractor shall immediately make such alterations as are necessary to make the work comply with the plans and specifications, and to the satisfaction of the Engineer.

Upon the completion of such repairs and the satisfactory completion of the operating test, the Engineer shall issue his certificate of final acceptance and prepare the final estimate, the payment of which shall then become due.

2.42 Acceptance of Final Estimate: The acceptance by the Contractor of the final estimate, shall operate as a release to the Owner from all claims and liabilities to the Contractor for all work done or materials furnished, or for any act of the Owner or its agents affecting the work.

SECTION NO. 3

GENERAL SPECIFICATIONS

CONTROL OF MATERIALS

3.01 Source of Supply and Quality of Materials: At the option of the Engineer the source of supply of each of the materials shall be approved by the Engineer before the delivery is started. Representative preliminary samples of the character and quantity prescribed shall be submitted by the Contractor or producer for examination and tested in accordance with the methods referred to under Samples and Tests. Only materials conforming to the requirements of these Specifications and approved by the Engineer shall be used in the work. All materials proposed to be used may be inspected or tested at any time during their preparation and use. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish a proved material from other approved sources. No material, which after approval has in any way become unfit for use, shall be used in the work.

3.02 Samples and the Testing of Materials: Unless otherwise provided for, standard tests of materials will be made in accordance with the specifications and tests of the American Society for Testing Materials, by commercial testing laboratory approved by the Engineer, and reports of such tests will promptly be furnished to the Engineers. Tests will be arranged for by the Contractor when so directed by the Engineers. The cost of all tests will be paid by the Contractor.

The following schedule of materials and the standard tests to which each is to be subjected are given for the Contractor's guidance.

CEMENT:

(a) Less than carload lots	- The brand of a mill in successful operation for at least one year.
(b) 1 car to 5 cars	- Certificate of mill test to be furnished by producers or laboratory tests made as per (c) or (d)
(c) 5 cars and up	- Independent Laboratory tests as per A.S.T.M. Standards or Federal Specification Board.
(d) Bin testes	- As for (c) with test bin sealed.

SAND: For use in Cement Concrete:

(a) 10 tons to 100 tons	- Field tests only: (1) Color for organic matter (2) Decantation test for silt (3) Sieve Analysis
(b) For each additional 100 tons	- Independent laboratory tests to indicate conformity with A.S.T.M. Designation C33-31T, as amended to date.

STONE & GRAVEL: For use in Cement Concrete:
(Coarse Aggregate)

(a) 10 tons - 200 tons	- Similar to Sand (a)
(b) Each additional 200 tons	- Similar to Sand (b)

CONCRETE:

Cylinder compression tests made from samples taken at two different times during the pour, in accordance with A.S.T.M. Designation C-39-33, tests to be made by Independent Laboratory, the number of tests to be determined by the Engineer.

BRICK: (Building):

(a) 1 to 5 Thousand -	Visual inspection for shape, color, soundness, freedom from cracks, balls or clay or particles of lime.
(b) For each additional 50 Thousand or part thereof	Absorption test and either compression or flexure tests, A. S. T. M. Designation C-62-30 and C-67-31, by an independent laboratory.

BUILDING STONE:	
(a) 1 to 5 Thousand	Visual inspection for shape and color.
(b) For each additional 5 Thousand or part thereof	Same as (a); also tests for absorption and compression as per A.S.T.M. Designation C97-31T and C98-30T.
VITRIFIED CLAY SEWER PIPE:	
(a) Any quantity	For shape, cracks, blisters, absence of vitrification; hammer test.
(b) For each 5,000 feet	Laboratory tests in amounts and character as per A.S.T.M. Designation C-13-33T.
CONCRETE SEWER PIPE: Non Reinforced and Reinforced Concrete Sewer Pipe	
(a) Any quantity	Visual inspection for shape, uniformity, density; hammer test.
(b) For quantities in excess of 500 feet	Not less than 0.5 per cent of the number of pipes in each size of pipe furnished, except that in no case shall less than two specimens be furnished. See A.S.T.M. Designation C14-34T and C75-34T for design and tests.
CAST IRON PIPE AND SPECIAL CASTINGS:	
(a) Up to 200 Tons	Certified tests furnished by foundry, field tests for dimensions, coating, and holes; hammer test.
(b) 200 Tons and Over	Tests at foundry under supervision and inspection of independent laboratory. See A.S.T.M. Designation A44-04 for design and test requirements.
STEEL PIPE:	
(a) For Electric Fusion Welded Steel Pipe 30" and over	A.S.T.M. Specifications shall apply: Designation A-134-32T. Each pipe section shall be tested in the shop under supervision of an independent laboratory.

STRUCTURAL STEEL:

(a) Any quantity	Field inspection for rust, shape and dimensions.
(b) 25 to 200 Tons	Independent shop inspection and certified copies of mill tests.
(c) Over 200 Tons	Mill and shop inspection by independent laboratory.
(d) For Bridges	See A.S.T.M. Designation A7-33.
(e) For Buildings	See A.S.T.M. Designation A9-33.

CONCRETE REINFORCEMENT STEEL:

(a) Up to 50 Thousand lbs.	Field inspection for rust, shape and dimensions.
(b) 50 Thousand lbs. and up	Independent laboratory inspection as follows: (1) Billet Steel - A.S.T.M. Designation A-15-35 (2) Rail Steel - A.S.T.M. Designation A-16-33 (3) Cold-drawn Steel Wire - A.S.T.M. Designation A-82-34

CAST IRON PIPE AND SPECIALS

3.03 Work Included: The Contractor shall furnish and place all bell and spigot pipe and specials and all flanged pipe and specials, wherever called for on the plans, inside or outside of structures, including the furnishing of all labor and material for furnishing, hauling, laying, jointing, testing, supporting, cleaning and painting, where required.

3.04 Quality and Class: All cast iron pipe furnished shall be in strict accordance with the latest standard specifications of the American Waterworks Association or Federal Specifications, W. W. P. No. 421. In general, straight pipe shall be Belland Spigot, Class 150, unless otherwise called for on plans or specified.

3.05 Specials: All specials shall be in accordance with the latest standard specifications of the American Waterworks Association, unless otherwise shown on plans, and shall be of a class at least one size heavier than the class called for under straight pipe, unless otherwise specified.

Specials shall consist of standard American Waterworks fittings, bell and spigot or flanged, among which are tees, bends, crosses, "Y" branches, sleeves, reducers, wall castings, plugs, or other special cast iron fittings forming a part of the pipe system.

The weight and class letters shall be plainly and conspicuously painted in white on the inside of each pipe and special casting after the coating has hardened.

3.06 Inspection: All cast iron pipe and special castings will be subject to inspection as provided for under "Control of Materials".

These tests shall not relieve the Contractor of the responsibility for inferior or imperfect materials or workmanship, or for the prevention of any damage between the time of shipment and the time of final acceptance of the work.

No pipe shall be accepted, the weight of which is less than the standard weight by more than five (5%) per cent for pipe, 16 inches or less in diameter,

and four (4%) per cent for pipe more than sixteen (16) inches in diameter. The American Waterworks specifications regarding minimum and maximum weights for specials shall apply.

3.07 General Provisions Relative to Laying Cast Iron Pipe and Specials: Proper and suitable tools for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe coating from being damaged, particularly on the inside of the pipes.

All pipe shall be carefully examined for cracks and other defects and no pipe or casting shall be laid which is known to be defective. If any pipe or other casting is discovered to be cracked, broken or defective, after being laid, it shall be removed and replaced by sound pipe, without further charge.

The pipe shall be thoroughly cleaned before being laid and shall be kept clean until accepted in the completed work.

Pipe shall be laid to accurately conform to the lines and grades established by the Engineer.

When pipe is laid in trenches, care shall be taken to give the pipe a solid bearing throughout its entire length, and in refilling the trenches the earth filled into the bottom of the trench under, and up to a cover of two feet over the top of the pipe, shall be of selected material and shall be carefully packed and rammed with proper tools for the purpose.

Wherever required by the Engineer, suitable wood blocks or wedges shall be furnished and placed, without further compensation than is included in the prices bid for furnishing and laying pipe.

Care shall be taken in laying that all pipe is firmly driven home before yarning.

3.08 Jointing Bell and Spigot Pipes with Lead Joints: The inside of the bell and the outside of the spigot of the pipe shall be thoroughly cleaned. Only joint runners in good condition will be allowed to be used on the work.

All lead joints shall be made with best quality braided or twisted hemp yarn or jute, free from tar, and cut into lengths as necessary, and tightly driven home in such a manner as to properly center the spigot in the bell.

The lead shall be of the best quality virgin lead, pure and soft and suitable for calking. The depth of the lead joints after calking shall be not less than 2-1/2 inches for sizes 10 inches and less in diameter, not less than 2-3/4 inches for sizes 10 inches to 16 inches, inclusive, and not less than 3 inches for sizes larger than 16 inches.

The melting pot shall be kept near the joint to be poured and not more than one pouring shall be made for each joint. Dross shall not be allowed to accumulate in the melting pot. The joints shall be thoroughly calked by competent mechanics, in such a manner as to secure a tight joint without over-straining the iron in the bells.

All defective joints shall be melted out and replaced to the satisfaction of the Engineer. Non-metallic joint compounds may be used only if specified under Detailed Specifications.

3.09 Jointing Flanged Pipe: All flanges, unless otherwise required, shall have standard drillings. Gaskets of rainbow rubber, or equal with cloth inserts, shall be used. Flanges shall be firmly bolted with machine bolts of the proper size and thread. The bolts and nuts shall be of the best quality refined bar iron, with good, true threads, and shall be so tightened as to evenly distribute the stress in the bolts and bring the pipe into uniform alignment.

3.10 Cutting: Wherever pipe or special castings are required to be cut, the cutting shall be done by skilled workmen.

3.11 Cleaning: The Contractor shall clean pipe before joining as hereinbefore specified, and shall keep exposed ends of pipe properly plugged during laying to prevent dirt and other material entering the line, and he shall also, before the system is accepted, thoroughly clean all lines.

3.12 Testing: When a section of pipe of a length deemed adequate by the Engineer is ready for testing, the line shall be thoroughly blown free from air and a leakage test made, and the Contractor shall furnish all labor, materials and equipment for carrying out these tests.

Joints which leak shall be carefully recaulked, if of lead, and retested under the same conditions and under the same period of operation. If joints are then found to be defective, they shall be melted out and replaced until the line passes the required test.

Any cracked or broken pipe or valves shall be removed and replaced, at the expense of the Contractor, with sound pieces.

The measured leakage, when tested at 25 lbs. above working pressure, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. Duration of tests shall be not less than 2 hours or more than 24 hours.

Whenever conditions will permit, in the opinion of the Engineer, the pipes shall be tested before the trench is backfilled. All joints shall be examined during the open trench test and all visible leaks entirely stopped.

The Contractor shall furnish, install and remove all temporary flanges, plugs or bulkheads to permit the required pressure tests, and all material, labor and equipment required to carry out the tests and to replace defective material.

3.13 Connections to Existing Lines: Connections to existing lines shall be made only at such times and in such manner as will meet operating requirements. No cut shall be made in esisting lines until the permission of the Superintendent of Water Works has been obtained as to time and manner of making the cut and connections.

3.14 Payment: The quantities of pipe and specials shown on plans, or specified in the proposal sheet, are to be used in computing the price bid. Should the quantities actually used in the work vary from the quantities shown, additions to or deductions from the lump sum bid will be made at the unit prices bid.

EARTH WORK

3.15 General: The Contractor shall make all excavations necessary for the construction of all structures, including all appurtenances, shown on plans or specified.

The price bid for the work shall include not only the necessary excavation of all material on the site but also shall include all clearing and grubbing, the storing of sufficient of this material in temporary spoil banks for the use of backfilling around structures, the selection of such materials as are to be placed in fill around structures, grading the site as shown on plans and the disposal of surplus material at the locations shown on plans, and shall also include the furnishing, placing and removing of all sheeting and bracing, and shall also include the draining and pumping of all excavations, the compacting of the excavations and backfill, the supporting of all completed or existing structures above and below the ground.

3.16 Trenching and Trimming: The excavations must be of sufficient width to permit the work to be done in the manner and of the size specified and shown on the drawings, and for removing any material which the Engineer may deem unsuitable for foundations. Wherever the nature of the ground will admit, the bottom of the excavation is to have the shape and dimensions of the outside of the bottom of the conduit, pipe or other structure. The beds for the drains, conduits, pipes or other structures shall be brought to the proper shape by trimming. Excavations for masonry structures shall not be plowed, scraped or machine dug closer than six inches to the finished sub-grade; the last six inches shall be removed with pick and shovel to the exact lines and grade just before placing the masonry. Excavations for cut-off walls or concrete filled trenches, where shown on the plans or ordered by the Engineer, shall be made as closely as possible to the neat lines of the masonry and they shall be filled solidly with concrete.

3.17 Unauthorized Excavation: If any excavation is caused by the Contractor's error, or wherever the excavation is carried beyond or below the lines and grade given by the Engineer, the Contractor shall, at his own expense, refill all such excavated space with such material and in such manner as may be directed, in order to insure the stability of the various structures. Beneath all structures, space excavated without authority, shall be refilled with Class "C" concrete by the Contractor at his own expense.

3.18 Extra Earth Excavation: Wherever, in the opinion of the Engineer, the material found at the grades shown on the plans for the floors, wall footings, or pipe inverts, is not satisfactory, the Contractor shall make any additional excavations as directed by the Engineer, and shall refill the same to two inches above the required grade with selected material from the excavation, which shall be broken fine, puddled, and tamped, and shall roll or tamp and hand grade the same as specified above. If this fill is of material excavated on the site, no further price will be paid than the price bid for earth excavation. If the Engineer shall order the refill to be made either with borrowed material or with broken stone, concrete, or other material, the Contractor shall be paid for same under the appropriate item listed in the proposal.

3.19 Removal of Water: The Contractor shall at all times during construction provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the excavation or other parts of the work and shall keep said excavation dry until the structures to be built thereon are completed. No masonry shall be laid in water nor shall water be allowed to rise over masonry until the concrete and mortar has set at least twenty-four hours.

The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. No water shall be drained into work built or under construction unless the consent of the Engineer is first obtained.

3.20 Test of Earth Foundations: The Contractor shall in no case build any concrete, masonry or other structures on an earth foundation until it shall have been tested and/or approved. He shall furnish all labor, materials and equipment which may be required for making tests of the bearing capacity of the earth, and shall dig test pits and make other excavations, as directed, to determine the character of the foundation. Tests, where required, will be made by loading a suitable platform to 10,000 lbs., the platform to have a bearing footing of 12 square inches.

Excavations for test of earth foundations will be paid for per cubic yard of excavation, but no other payment will be allowed in connection with such tests.

3.21 Compacting Foundations: Wherever the development of suitable foundation conditions requires, the Contractor shall take the proper means of compacting such foundation material. After excavation to grade, the surface shall be rolled with a 3-wheel 10-ton power roller, or shall be tamped, or otherwise consolidated to adequately prepare the bottom for the loads to come upon it, if so directed by the Engineer. Where so required, broken stone, furnished and paid for under the price bid for this item, shall be placed on the surface and shall be rolled into the sub-grade in such thickness as may be required by the Engineer. All work of compacting foundations shall be included in the prices bid for excavation, with the exception that broken stone or other material used for such work will be paid for under appropriate items, except as specified.

3.22 Disposal of Material: Excess material excavated shall be disposed of at the locations shown on plans and to the lines and grades established by the Engineer. Spoil banks shall be neatly dressed and left in smooth and presentable condition. The Excavated material which must be used for backfill may be temporarily disposed of on the site of the work but it shall not be done in a manner to interfere with the satisfactory carrying out of the work nor shall it

be dumped in such a location as to cause pressures against newly placed masonry.

All costs of disposal of surplus excavated material shall be included in the prices for excavation.

3.23 Back-Filling: All lumber, rubbish, and braces shall be carefully removed from behind walls or other structures, unless ordered left in place by the Engineer. Unless otherwise specified, all trenches or excavations, shall then be backfilled up to the original surface of the ground or up to such grades as shall be directed. The backfilling shall be done as completely as possible in such manner as to prevent after-settlement around all structures. The trenches and excavations shall be thoroughly wet down with water while the backfilling is being placed.

As soon as practicable, after the pipe or masonry has been placed and the cement has acquired a suitable degree of hardness, the backfilling shall begin, and shall thereafter be prosecuted expeditiously.

The Engineer shall have the right to make such selection of the material for various portions of the back fill as may be required for the satisfactory execution of the work.

3.24 Temporary Bridges and Crossings: The Contractor shall, wherever required in order to expedite the work or where required to maintain traffic, or where otherwise ordered by the Engineer, construct temporary bridges and crossings of adequate sized members to safely carry the loads which will come upon them, and the sizes of the members used shall meet with the approval of the Engineer.

The cost of furnishing all labor, tools, materials and equipment, shall be included in the prices bid for excavation.

3.25 Restoration of Surface of Ground: During construction all work of keeping streets and right-of-way in a passable condition by refilling sunken ditches, laying temporary paving over trenches, etc., shall be done in a manner satisfactory to the Engineer. If any such work is not done within five (5) days after written notice given by the Engineer, the work may be done by the Owners and the expense thereof paid by the Contractor or deducted from sums due the Contractor under this contract.

ROCK EXCAVATION

3.26 Rock Excavation Defined: Rock excavation shall comprise solid rock in the original bed or well defined ledges, the removal of which, in the opinion of the Engineer, requires drilling, blasting or the use of jack hammers or bull points; and also shall include all boulders or detached pieces of rock eight (8) cubic feet or more in content.

3.27. Blasting: Blasting operations shall be conducted in strict accordance with all existing ordinances and regulations, and all blasting shall be done as directed by the Engineer. All exposed structures shall be carefully protected from the effects of blast and all blasts shall be covered with heavy timbers or other suitable material. The blasting shall be done only by experienced men. No blasting operation shall be started without the Engineer's approval of method and quantity of explosive to be used. Any damage done shall be promptly repaired by the Contractor at his own expense. Where there are no local ordinances governing blasting and the storage of explosives, all blasting supplies shall be stored in a manner approved by the Engineer, and a watchman shall be stationed at all times at the place of storage. In no case shall caps or other exploders be kept at the place where dynamite or other explosive is stored.

3.28 Payment: The Owner does not guarantee that the actual amount of rock to be encountered will conform to the quantities shown on the plans and given in the proposal. Payments made for rock excavation will be based upon actual quantities as measured in the field, deduction or addition being made in the lump sum for variation from the quantities given in the proposal sheet, in accordance with the unit price bid for rock excavation. Measurement shall be made to the neat lines of the structures except as specified.

CONCRETE

3.29 Fine Aggregate for Concrete: The Contractor shall furnish all tools, material and labor and construct complete all concrete work shown on plans and specified.

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated, siliceous grains, free from injurious amounts of organic matter, loam or other deleterious materials. It shall be graded from fine to coarse with the coarser particles predominating within the following limits:

Passing No. 4 sieve - 95%
Passing No. 20 sieve - 30 to 70%
Passing No. 50 sieve - Not more than 30%

The fine aggregate shall be of such quality that mortar briquettes, cylinders or prisms, consisting of one part by weight of Portland cement and three parts by weight of fine aggregate, mixed and tested in accordance with the methods described in the Standard Specifications and Tests for Portland cement (Serial Designation C-9-26) as amended, of the American Society for Testing Materials, shall show a strength at the age of 7 and 28 days not less than that of 1:3 Standard Ottawa sand mortar of the same consistency made with the same cement. Periodic laboratory tests by a laboratory approved by the Engineer shall be made at the Contractor's expense.

Upon failure to meet the grading and the Ottawa test requirements set forth in the foregoing paragraphs, material otherwise satisfactory for Class "A" concrete, having a test ratio of 85% or above, and material otherwise satisfactory for Class B and C concrete, having a test ratio of 75% or above, when compared with Standard Ottawa Sand, may be used provided the proportion of cement be increased so as to produce 100% strength ratio for material to be used in Class A concrete and 90% strength ratio for material to be used in Class B and C concrete. The extra proportions shall be determined by laboratory

tests, and the Contractor shall receive no extra compensation for such increase of cement.

No fine aggregate showing a color darker than the standard color, when tested in accordance with the Standard Method of Test for Organic Impurities in Sands for Concrete of the American Society for Testing Materials, shall be used.

3.30 Coarse Aggregate: Coarse aggregate shall consist of gravel or crushed stone.

All stone or gravel shall be free from disintegrated pieces, alkali, vegetable matter and adherent coatings.

The weight of extraneous substances shall not exceed the following percentages:

	Per Cent
Loss by decantation	1.25
Shale	1.00
Coal and Lignite	1.00
Clay lumps	0.05
Soft fragments	5.00
Cinders and clinkers	0.50
Free shells	1.00
Sticks (wet)	0.03

The sum of the percentages of all materials noted in above table shall not exceed 5.

The gravel shall consist of clean, tough, durable stone of high resistance to abrasion. "Run of Bank" gravel shall not be used. When subjected to an abrasion test for gravel, the loss shall not be more than 20 per cent.

3.31 Mixing Different Materials: Different types or sizes of coarse aggregate, even if tested and approved, shall not be mixed during use, nor used alternately in any one class of construction.

3.32 Gradation of Coarse Aggregate: All coarse aggregate shall be uniformly graded from coarse to fine. It shall not contain more than 7 per cent of weight of material that will pass a screen having 1/4 inch openings and shall

be well graded between 1/4 inch and 1-1/2 inches, except that in all work where the least dimension is 6 inches or less, the coarse aggregate shall pass a screen having 3/4 inch opening.

3.33 Cement: Cement shall be used in the proportion of 25% Puzzolan and 75% Portland.

3.34 Puzzolan Cement - Detailed Requirements:

Fineness: The residue on a standard 325 mesh sieve shall not exceed 15 per cent by weight. (Wet Process)

Setting Time: The neat paste mixed to normal consistency shall not develop initial set as determined by the Gilmore Needle in less than 45 minutes. The final set shall be attained within 30 hours.

Soundness: The pats of neat cement made as described under A.S.T.M. Designation C 77-32.

Strength: (a) TENSILE STRENGTH. The average tensile strength of not less than three standard briquettes, made and stored as described in A.S.T.M. Designation C 77-32 shall be not less than shown below:

Age of Test Days	Storage of Brinquettes 1 day moist air, 6 days water	Tensile Strength Lbs. per Sq. In.
7	1 day moist air, 6 days water	140
28	1 day moist air,27 days water	220

(b) COMPRESSIVE STRENGTH. The average compressive Strength of three 2-inch cubes made and stored according to method indicated under Paragraph 7 (d) shall be not less than shown below:

		Compressive Strength
7	2 days moist air, 5 days water	500
28	2 days moist air,26 days water	900

Packing & Marking

In accordance with methods as specified in A.S.T.M. Designation C 9-30, except that a bag shall contain 79 pounds net. A barrel shall contain 316 pounds net.

Physical Tests

The cement shall be sampled and tested in accordance with the standard method of testing Portland Cement, A.S.T.M. Designation C 77-32 with the following exceptions:

(a) Normal Consistency, Neat Cement: The normal consistency of neat cement shall be determined in accordance with method specified in A.S.T.M. Designation C 77-32, paragraph 25, except that the past shall be mixed not less than 3 minutes, nor more than 3-1/2 minutes.

(b) Percentage of Water for Standard Mortars: The consistency of standard mortar shall depend on the amount of water required to produce a paste of normal consistency. Having determined the normal consistency of the cement, the consistency of the standard mortar shall be as indicated in Table I, A.S.T.M. Designation C 77-32, the values being in percentage of the combined dry weights of cement and standard sand.

(c) Tensile Strength Test: The tensile strength test shall be conducted in accordance with methods specified in A.S.T.M. Designation C 77-32, paragraphs 35 thru 45, except that the mortar shall be mixed for not less than 3 minutes nor more than 3-1/2 minutes, and the test specimens shall be kept in the molds in the moist room for 24 hours before placing them in water.

(d) Compressive Strength Test: Standard 2" x 2" metal molds shall be used for molding test specimens. Mortar shall be mixed and cubes filled and molded in accordance with methods as specified for tensile strength specimens in A.S.T.M. Designation C 77-32, paragraph 39, except that mortar is to be mixed not less than 3 minutes nor more than 3-1/2 minutes.

3.35 Portland Cement: Portland Cement shall conform to the Standard Specifications of the American Society for Testing Materials. Cement shall be furnished in strong bags containing at least 94 pounds net; it shall be stored in a suitable, tight storehouse, having wooden floors raised above the ground, and, of sufficient capacity to contain a two weeks' supply. Shipments shall be kept separately and the Engineer shall be promptly notified of the receipt of each shipment, so that he may break the seal and examine cement before unloading it from the car. Ample time shall be allowed for testing, which the Contractor shall have done at the mill by a Testing Laboratory acceptable to the Engineer. Before any cement is used, the 28 day test report on same shall be submitted to the Engineer and approved. Cement which is unsatisfactory shall be at once removed from the work. The Engineer shall have the right to use such means as may be necessary to insure the cement being under his charge and direction at all times.

3.36 Cement Tests: Tests on Cement shall be made by a testing laboratory approved by the Engineer in general in accordance with the latest standard methods of the American Society for Testing Materials, as set out under "Control of Materials", at the Contractor's expense.

3.37 Concrete: Concrete shall be of three different classes, as herein specified:

	Approximate Mixture	Required Minimum Compressive Strength 28 Days
Class A	1:2:4	2700 lbs. sq. in.
Class B	1:2-1/2:5	2000 lbs. sq. in.
Class C	1:3:6	1500 lbs. sq. in.

Class A. Concrete shall be used throughout the work except where expressly noted on plans.

One bag of cement shall be considered as having a volume of one cubic foot and the sand and stone shall be measured loose.

Before pouring concrete, the concrete materials, including cement, fine aggregate, coarse aggregate and water, shall be mixed in the proportions in which they are to be used in the work and tested by a testing laboratory approved by the Engineers, in accordance with Standard Methods of Test. The mix so tested shall, at 28 days, develop a strength not less than that specified for the class of concrete being tested. Upon failure to meet this requirement, the proportion of cement in the concrete mix shall be increased or the proportion of cement, fine aggregate, coarse aggregate and water shall be changed in such a way as to produce the specified strength. In no case shall a mix be used containing less cement than 5.75 bags per cubic yard of Class A concrete, unless specifically permitted in writing by the Engineers. In special cases, where additional cement is ordered by the Engineer in writing, in excess of the above ratio, such cement will be paid for at the net cost to the Contractor plus 5 per cent handling charge.

3.38 Mixing Concrete: The concrete shall be mixed by an approved batch machine, such as will secure a suitable mixing of each batch of concrete. These arrangements shall provide for the correct measurements of each of the ingredients before placing in the mixer, and the introduction of a measured quantity of water at any stage of the process.

No concrete shall be mixed when or while the air temperature in the shade and away from artificial heat is as low as 40 degrees, Fhr., and falling. Concrete may be mixed and placed when the air temperature in the shade and away from artificial heat is 35 degrees, Fahr., and rising. The heating of materials or the addition of salt or other chemicals will not be permitted. No materials containing frost shall be used. Bags of cement, or fine aggregate containing lumps or crusts of hard material shall not be used. The concrete shall be mixed only in such quantity as is required for immediate use and any which has developed initial set or has been mixed longer than 30 minutes shall not be used.

When the temperature of the air in the shade and away from artificial heat falls below 50 degrees, Fahr., the mixing water may be required to be heated so that the temperature of the concrete, when deposited, shall not be less than 45 degrees, Fahr. No concrete is to be placed on a frozen subgrade.

(a) Machine Mixing - Concrete shall be thoroughly mixed in a batch mixer of an approved type and size and one so designed as to positively insure a uniform distribution of the materials throughout the mass. Concrete shall be mixed for a period of not less than 1-1/2 minutes, after all the materials are in the drum, for Classes A, B, and C concrete.

During the period of the mixing, the drum shall operate at the speed for which it has been designed. Such speed, however, shall preferably not be less than 175 nor greater than 225 feet per minute at the periphery of the drum, or not less than 14, nor more than 20 revolutions per minute. The entire contents of the mixer shall be removed from the drum before the materials for the succeeding batch are placed therein, and the mixer shall preferably be equipped with mechanical means for preventing the addition of aggregates after mixing has commenced. No mixer shall be operated above its rated capacity and no mixer shall be used which has a rated capacity of less than 1 bag batch.

The first batch of concrete materials placed in the mixer shall contain an additional quantity of sand, cement and water sufficient to coat the inside surface of the drum without diminishing the mortar content of the mix. Upon the cessation of mixing for any considerable length of time, the mixer shall be thoroughly cleaned by flushing it with water.

(b) Hand Mixing -- Hand mixing shall not be permitted, except in case of emergency and under written permission of the Engineer. When permitted, it shall be done only on watertight platforms. The sand and cement shall then be thoroughly mixed while dry by means of shovels until the mixture is of a

uniform color, after which it shall be formed into a "crater" and water added in an amount necessary to produce mortar of the proper consistency. The material upon the outer portion of the "crater" ring shall then be shoveled to the center and the entire mass turned and sliced until a uniform consistency is produced. The coarse aggregate shall then be thoroughly wetted and added to the mortar and the entire mass turned and returned at least 6 times and until all the stone particles are thoroughly covered with mortar and the mixture is of a uniform color and appearance. Hand mixing will not be permitted for concrete to be placed under water. Hand mixed batches shall not exceed 1/2 cubic yard in volume.

3.39 Retempering: Concrete shall be mixed only in such quantities as are required for immediate use and all such material shall be used while fresh and before initial set has taken place. No retempering of concrete shall be allowed. No material that has overrun from mixer shall be used.

3.40 Concreting in Cold Weather: No concrete shall be placed when the atmospheric temperature is below 35 degrees Fahrenheit.

After concrete has been placed, if the temperature drops below 35 degrees Fahrenheit, the Contractor shall provide sufficient canvas and frame work or other types of housing to enclose and protect the structure in such a way that the air surrounding the fresh concrete can be kept at a temperature of not less than 45 degrees Fahrenheit for a period of 5 days after the concrete is placed.

The Contractor shall assume all risk connected with the placing of concrete under above conditions and permission given by the Engineer to place concrete under above conditions will in no way relieve the Contractor of responsibility of proper results. Should concrete placed under such conditions prove unsatisfactory, it shall be rejected.

3.41 Forms - General: Forms shall be so designed and constructed that they may be removed without injuring the concrete. The lumber used in the forms for

beams and slabs shall be not less than one inch (commercial) in thickness.

Form lumber for all exposed surfaces shall be dressed four sides. Lumber for backing or other unexposed surfaces shall be dressed two edges. All lumber shall be free from knot holes, loose knots, cracks, splits, warps, or other defects affecting its strength or the appearance of the finished concrete surfaces. They must be effectively braced. When possible, forms shall be day-lighted at intervals not greater than 10 feet vertically, the openings being sufficient to permit of free access to the forms for the purpose of inspecting, working and spading the concrete.

The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar tight and, if necessary, to close cracks due to shrinkage, shall be thoroughly soaked with water. Forms for re-entrant angles shall be chamfered and for corners shall be filleted. Dimensions affecting the construction of subsequent portions of the work shall be carefully checked by the Contractor after the forms are erected and before any concrete is placed. The interior surfaces of the forms shall be adequately oiled, greased or soaped to insure non-adhesion of mortar. Form lumber which is to be used a second time shall be free from bulge or warp and shall be thoroughly cleaned. The forms shall be inspected by the Contractor immediately preceding the placing of concrete and any bulging or warping shall be remedied and all dirt, sawdust, shavings or other debris within the forms shall be removed.

In designing forms and centering, the concrete shall be treated as a liquid weighing 150 pounds per cubic foot for vertical loads, and 85 pounds per cubic foot for horizontal pressure. The unsupported length of the wooden columns and compression members shall not exceed 30 times the diameter or least side.

Blocks and bracing shall be removed with the forms and in no case shall any portion of the wood forms be left in the concrete. Special attention shall be paid to the ties and bracing, and where the forms appear to be insufficient-

ly braced, or unsatisfactorily built, either before or during construction, the Engineer shall order the work to be stopped until the defects have been corrected to his satisfaction.

The forms shall be so constructed that the finished concrete shall be of the form and dimensions as shown on the plans and true to line and grade.

Bolts and rods shall be used for internal ties, they shall be so arranged that when the forms are removed, no metal shall be within 1 inch of any surface. Wire ties will be permitted only on light and unimportant work; they shall not be used through surfaces where discoloration would be objectionable. Forms shall be set to line and grade and so constructed and fastened as to produce true lines. Special care shall be used to prevent bulging. On all work requiring watertightness, the method of sealing holes left by the withdrawal of the tie rods shall be subject to the approval of the Engineer.

3.42 Placing Concrete: All concrete shall be placed in daylight, and the placing of concrete in any portion of the work shall not be started unless it can be completed in daylight, unless written permission tonthe contrary is given by the Engineer. Such permission will not be given unless an adequate lighting system, such as gas, carbide, or acetylene light, or electric light is provided. No concrete shall be placed until the depth and character of the foundation, the adequacy of the forms and falsework, and the placing of steel have been approved by the Engineer.

Concrete shall be placed in the forms immediately after mixing and in no case shall concrete be used which does not reach final position in the forms within 30 minutes after the time that water is first added to the mix. The method and manner of placing shall be such as to avoid the possibility of segregation or separation of the aggregates or the displacement of the reinforcement. Concrete shall not be hauled from the mixer to the point of deposit except by wheelbarrows or hand-operated concrete buggies, unless otherwise

permitted in writing by the Engineer. If the quality of concrete as it reaches the forms, or the methods of placing or working therein are not satisfactory, the Contractor shall, upon orders from the Engineer, re-equip his plant for placing the concrete in a satisfactory manner.

Troughs, pipes or chutes used as aids in placing concrete shall be arranged and used in such a manner that the ingredients of the concrete are not separated. The angle of chute shall not exceed 30 degrees with the horizontal unless otherwise permitted by the Engineer in writing, in which case the chutes shall be equipped with baffle boards or be in short lengths that change the direction of the movement. When pipes are used, they shall be kept full of concrete and have their lower ends kept buried in fresh concrete in the same manner that a tremie is used. All chutes, troughs and pipes shall be kept clean and free from coatings of hardened concrete by thoroughly flushing with water after each run. Open troughs or chutes shall be either of metal or metal lined, and shall extend as nearly as possible to the point of deposit. When the discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.

Placing of concrete shall be so regulated that the pressure caused by the wet concrete shall not exceed that used in the design of the forms. Special care shall be taken to fill each part of the forms by depositing concrete directly as near final position as possible, and to work the coarse aggregate back from the bars without displacing them. After the concrete has taken its initial set, care shall be exercised to avoid jarring the forms or placing any strain on the ends of projecting reinforcing bars. Concrete shall be compacted by continuous working with a suitable tool in a manner acceptable to the Engineer.

Slab and girder work, walls and all thin section work shall be thoroughly worked with a steel slicing rod. All faces shall be well spaded and the mortar flushed to the surface of the forms by continuous working with a concrete spading implement acceptable to the Engineer. Concrete in floor slabs and in walls,

where required by the Engineer, shall be compacted by vibrating with an approved mechanical vibrator.

In all cases where, on account of the obstruction produced by reinforcing metal, shapes or forms, or any other uncontrollable condition, difficulty is encountered in puddling the concrete adjacent to the forms, or where required by the Engineer, the mortar content of the mix shall be brought into proper contact with the interior surfaces by vibrating the concrete. The vibration shall be produced by mechanical vibrators of proper design placed in the concrete.

Concrete shall be placed in continuous horizontal layers, the thickness of which generally shall not exceed 10 to 12 inches, except as provided for the different types of construction. When it is necessary by reason of any emergency to place less than a complete horizontal layer at one operation, such layer shall terminate in a vertical bulkhead.

In any given layer the separate batches shall follow each other so closely that each one shall be placed and compacted before the preceding one has taken initial set, in order that there will be no line of separation between the batches. Each layer of concrete shall generally be left somewhat rough to secure efficient bonding with the next layer above. A succeeding layer placed before the underlying layer has become set shall be compacted in a manner that will entirely break up and obliterate the tendency to produce a construction joint between the layers.

Layers completing a day's work or placed just prior to temporarily discontinuing operations shall be cleaned of all "laitance", or other objectionable material as soon as the surface has become sufficiently firm to retain its form. To avoid visible joints as far as possible upon exposed faces, the top surface of the concrete immediately adjacent to the forms of the exposed face shall be finished by being smoothed with a plaster mason's trowel.

Horizontal layers so located as to produce a construction joint wherein a "feather-edge" might be produced in the succeeding layer shall be so formed by inset form work that the succeeding layer will end in a body of concrete having a thickness of not less than 6 inches.

In no case shall the work on any section or layer be stopped or temporarily discontinued within 18 inches below the top of any face, unless the details of the work provide for a coping having a thickness of less than 18 inches, in which case, at the option of the Engineer, the construction joint may be made at the under side of the coping. The method and manner of placing concrete shall be so regulated as to place all construction joints across regions of low shearing stress and in such locations as will be hidden from view to the greatest possible extent. The method and sequence of placing the various types of concrete shall be as specified herein for the particular type of construction involved.

The operation of depositing and compacting the concrete shall be conducted so as to form a compact, dense, impervious, artificial stone of uniform texture which shall show smooth faces on exposed surfaces.

If any section of concrete is found porous, has been plastered, or is otherwise defective, it shall be removed and replaced in whole or in part entirely at the Contractor's expense, as directed by the Engineer.

3.43 Depositing Concrete Under Water: Concrete shall not be exposed to the action of water before setting, or deposited in water, except upon approval of the Engineer, and under his immediate supervision.

When concrete is so deposited, the method and manner of placing shall be as hereinafter designated. Concrete deposited under water shall be carefully placed in the space in which it is to remain in a compacted mass. by means of a tremie, a closed bottom bucket, of not less than one cubic yard capacity or other approved method, and shall not be disturbed after being deposited.

All Seal concrete shall be deposited in one continuous pour. No concrete shall be placed in running water and all form work designated to retain concrete under water shall be water-tight. Special care shall be exercised to prevent segregation and the consistency shall be carefully regulated. The following requirements shall be complied with:

(a) The method of depositing shall be regulated so as to produce approximately horizontal surfaces.

(b) When a tremie is used, it shall consist of a tube having a minimum inside diameter of 10 inches, constructed in sections having flanged couplings fitted with gaskets. The discharge end shall be entirely sealed at all times and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised, but not out of the concrete at the bottom, until the batch discharges to the bottom of the hopper. The flow is then stopped by lowering tremie.

(c) The means of supporting the tremie shall be such as to permit the free movement of the discharge and over the entire top surface of the work, and shall permit its being rapidly lowered when necessary to choke off or retard the flow.

(d) The flow shall preferably be continuous and in no case shall be interrupted until the work is completed.

(e) Special care must be exercised to maintain still water at the point of deposit.

(f) When the concrete is placed by means of a bottom dump bucket, the following precautions shall be observed.

The bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. The bucket shall then be very slowly raised during the discharge travel, the intent being to maintain, as nearly as possible, still water at the point of discharge and to avoid agitating the mixture.

3.44 Bonding Construction Joints: When the work of placing concrete is delayed until the concrete shall have taken its initial set, the point of stopping shall be deemed a construction joint. So far as possible, the location of construction joints shall be placed in advance, and the placing of concrete carried continuously from joint to joint. These joints shall be perpendicular to the principal lines of stress and, in general, be located at points of minimum shear. Horizontal joints in walls will not be permitted.

Where construction joints are to be water-tight, keys and plates shall be provided as shown on plans, the joint to be mopped with hot pitch as specified.

The entire floor slabs, reinforced beams, girders, curbs, and other important primary members shall be poured continuously as specified on the plans or as directed by the Engineer.

In joining fresh concrete to concrete that has already set, the work already in place shall have its surface cut over thoroughly with a suitable tool, approved by the Engineer, to remove all laitance, loose and foreign material. This surface shall then be washed and scrubbed with wire brooms, thoroughly drenched with water until saturated, and then remain saturated until the new concrete is placed.

Immediately prior to the placing of the new concrete, the old surface shall be thoroughly coated with a very thin coating of neat cement mortar and all forms drawn tight against the face of the concrete.

The size and spacing of keys and dowels shall be as determined by the Engineer. Specific requirements for the different types of construction shall be so specified herein.

3.45 Sliding Joints: Where sliding joints are to be provided at the ends of the slabs, girders or beams or between walls, etc., the surface of the supporting concrete shall be given a smooth finish and covered with two layers of three-ply roofing felt to separate the concrete.

3.46 Expansion Joints: Expansion joints shall be made as shown or specified.

3.47 Removal of Forms: The time of removal of forms shall be subject to the approval of the Engineer. No forms whatever shall be removed at any time without the consent of the Engineer. Such consent shall not relieve the Contractor of responsibility for the safety of the work.

3.48 Curing Concrete: Careful attention shall be given by the Contractor to the proper curing of concrete floors and finished surfaces. Such surfaces shall be protected from the sun and the whole structure shall be kept wet for a period of at least 10 days.

All concrete floors and the top of slabs and walls shall be covered as soon as possible with a covering of burlap and at least one inch of sand or earth or other suitable material and kept thoroughly moistened for a period of at least 10 days by sprinkling each morning and evening, or more frequently if deemed necessary by the Engineer.

The covering material shall not be cleared from the surface of the concrete for a period of 21 days, unless ordered by the Engineer.

3.49 Surface Finish: Ordinary - The external surfaces of all concrete masonry shall be thoroughly worked during the operation of placing, by means of a broadtined fork or a concrete spade of an approved type. The working shall be such as to force all coarse aggregate from the faces and thoroughly work the mortar against the forms to produce a smooth finish free from water and air pockets or honeycombs.

As soon as the concrete has set sufficiently to permit, the forms shall be carefully removed and all depressions resulting from the removal of the metal spacers and all other holes and rough places shall be carefully pointed with mortar of sand and cement in the proportion which has been employed for this particular class of concrete. The surface film of all such pointed surfaces shall be carefully removed before setting occurs.

3.50 Rubbing Concrete: After the surface has set sufficiently to permit, all surfaces exposed to view shall be thoroughly wetted and rubbed with a carborundum stone of medium fineness, or other equally good abrasive, to bring the surface to a smooth texture and remove all form marks. The paste formed by the rubbing, as above described, may be finished by floating with a canvas, carpet-faced, or cork float or rubbed down with dry burlap.

All horizontal surfaces used as walkways shall be floated with a wood float to an even surface, sufficiently rough to prevent slipping.

Surface of floors shall be smoothly finished with steel trowel.

3.51 Waterproofing: Concrete required to be watertight shall be made and poured in strict accordance with these specifications. The use of special admixtures, or integral waterproofing compounds in such work is not required but may be permitted in special cases, provided the material and methods used are approved in writing by the Engineer.

3.52 Water Tightness: All structures for holding or carrying water shall be practically watertight. A loss of 1/4" depth in 24 hours will be permitted when structures are filled. All exposed surfaces of water holding structures shall be free from visible damp spots or seepages, before acceptance.

3.53 Setting Pipe, Anchor Bolts, etc., in Concrete: The Contractor shall place in the concrete all pipes, frames and anchor bolts for all material and equipment. The items shall be placed accurately at the required points.

Care shall be taken to prevent pipes or fixtures placed in the concrete from being displaced, and the Contractor will be held responsible for the correct alignment as shown on plans. If any items are misplaced, or inaccurately set, they shall be reset at the expense of the Contractor. Where pipes or conduits pass through walls or floors which must be watertight, it will not be permissible to leave openings. In such cases, wall sleeves for the pipes or conduit must be set before pouring the concrete.

3.54 Permixed Concrete: Permixed concrete, that is, concrete mixed at a central plant and transported to the work may be used only where satisfactory evidence is furnished the Engineer that equipment and control of materials is satisfactory to carry on the work properly. The conditions under which premixed concrete may be used may be obtained from the Engineer when the source of supply is known.

3.55 Payment: The quantities shown on plans or specified are to be included in the lump sum bid. Should the quantities actually used in the work vary from the quantities shown or specified, additions to or deductions from the lump sum will be made at the unit prices bid.

REINFORCING STEEL

3.56 Description: All reinforcement material for concrete structures shall be furnished and placed by the Contractor. Bar reinforcement shall conform to the requirements of the standard Specifications for Billet-Steel, Concrete Reinforcing Bars, Serial designation A-15-35, as amended to date, of the American Society for Testing Materials, subject to the following restrictions.

All bars shall be of the intermediate steel grade made by the open hearth process.

The use of cold twisted bars will not be permitted.

Test specimens shall not be less than 48 inches long.

Bar reinforcement shall consist of bars of an approved deformed type such that a mechanical bond will be provided between the concrete and steel at frequent intervals.

3.57 Wire and Wire Mesh: Wire for concrete reinforcement either as such or in fabricated form, shall conform to the requirements of Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement, Serial Designation A-82-34 of the American Society for Testing Materials.

3.58 Expanded Metal: Expanded metal, when used shall be of a type approved by the Engineer and of metal equal in quality to that specified for bar reinforcement.

3.59 Structural Shapes: Structural shapes used in reinforcement for concrete construction shall conform to the requirements for structural steel.

3.60 Protection of Material: Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports, and shall be protected as far as practicable from mechanical injury and surface

deterioration caused by exposure to conditions producing rust. When placed in the work, it shall be free from dirt, rust, scale, dust, paint, oil or other foreign matter.

3.61 Bending: The reinforcement shall be bent cold to the shapes indicated on the plans. This shall be done in the shop, before shipment, and not in the field, unless otherwise noted on the plans or directed by the Engineer. The inside radius of bends shown as square bends shall not exceed the diameter of the bar.

3.62 Placing and Fastening: Steel reinforcement shall be placed in the exact position as shown on the plans, and held securely in place during the placing of the concrete. In no case will pushing of short bars into new concrete be permitted. Vertical stirrups shall always pass around the main tension members and be securely attached thereto.

The reinforcing steel in all concrete masonry walls shall be placed its proper distance from the face of the forms by means of approved precast mortar or concrete blocks.

All horizontal reinforcing steel shall be spaced vertically by means of approved precast mortar or concrete blocks.

All reinforcing steel shall be wired together at the intersections as shown on the plans or as directed by the Engineer.

Before any concrete is placed, all mortar shall be cleaned from the reinforcement.

No concrete shall be deposited until the Engineer shall have inspected the placing of the reinforcing metal and given permission to place concrete. All concrete placed in violation of this provision shall be rejected and removed.

3.63 Splices: All reinforcement shall be furnished in full lengths as indicated on plans.

Splices will have a length of not less than 40 times the diameter of the reinforcement, unless otherwise shown, and shall be well distributed or else located at points of low tensile stress. No splices will be permitted at points where the section is not sufficient to provide a minimum distance of two (2) inches between the splice and the nearest adjacent bar or the surface of the concrete. The bars shall be rigidly clamped or wired at all splices in a manner approved by the Engineer.

3.64 Metal Mesh: Sheets of metal mesh shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges.

3.65 Payment: The quantities shown on plans are to be included in the lump sum bid. Should the quantities actually used in the work vary from the quantities shown, additions to or deductions from the lump sum will be made at the unit price bid.

DIVISION 1.

SEWERS

3.66 WORK TO BE DONE. The Contractor shall furnish the material and construct the sewers, shown on the plans, together with all clearing, grubbing, excavating, sheathing, back-filling, foundations, manholes, lamp holes, flush tanks, catch basins, and other appurtenances, etc., as shown on the plans or as directed by the Engineer, and shall do whatever is required by the specifications. The work shall include all ditching, diking, pumping, bailing, draining and flushing, and all provisions necessary to protect and maintain buildings, fences, water pipes, drain culverts, and other structures, the furnishing and maintenance of suitable bridges and footways across intercepted streets and alleys, the replacing of pavements and sidewalks, the cleaning away of all rubbish and surplus materials, and the furnishing of all materials, tools, implements and labor required to build and put in complete working order the specified sewers and all structures appertaining thereto.

3.67 LOCATION AND GRADE. The line and grade of the sewer and the position of all manholes and other appurtenances will be given by the Engineer. The grade line as given on the profile or mentioned in these specifications means the invert, or bottom of the inside of the pipe, and the price for trenching shall include the trench for the depth below this line necessary to lay the sewer to this grade, but measurements for payment will be made only to the grade line.

3.68 All necessary lines, levels and grades will be given by the Engineer, and the Contractor shall provide such field men and assistants as the Engineer may request, and such planks, stakes, spikes, nails and other fastenings and necessary assistance as may be required for giving same.

3.69 ORDER AND LOCATION OF WORK. The City reserves the right to accept and use any portion of the work whenever it is considered to the public interest to do so, the Engineer shall have the power to direct on what line or street the Contractor shall work and order thereof. In general, the work shall be from the outlet to the mains, and thence to the laterals.

3.70 EXCAVATION. Not more than four hundred (400) feet of trench shall be opened at one time in advance of the completed sewer, unless by written order for the distance specified. The trench shall be at least six (6) inches wider on each side than the greatest external horizontal width of the sewer, including hubs, intended to be laid in them. The bottom of the trench under each pipe joint shall be slightly hollowed, to allow the body of the pipe to rest throughout its length. In case a trench is excavated at any place, excepting at joints, below the grade of its bottom as given, or directed by the Engineer, the filling to grade shall be done in such manner as the Engineer shall direct, without compensation.

The sides of the trenches shall be supported by suitable shoring and bracing whenever there is danger of sliding of earth. All timbers thus used shall be withdrawn as the filling progresses, unless when specially ordered to be left in place. Then the price bid in the proposal for lumber left in trench shall be paid. The bottom of the trenches shall be carefully and truly graded, formed and aligned, according to the grade and directions furnished by the Engineer, and to his full satisfaction, before any sewers are laid therein.

Where pipe is laid near curbing every precaution shall be taken to prevent disturbing the curbing or pavement and if same is disturbed it shall

be replaced in good condition without extra compensation.

When running sand, quicksand or other bad, treacherous ground shall be encountered, work shall be carried on with the utmost vigor.

Where the timber foundations are necessary, in the opinion of the Engineer, the pipes shall be laid on 2-inch planks or special design will be furnished to the Contractor, who in accordance with such designs shall place such foundations in position satisfactory to the Engineer.

Selected material, free from shakes, loose knots or other defects, shall be used and laid according to the direction of the Engineer. The sum bid per thousand feet (BM) shall be paid to the Contractor for timber in place ordered for this purpose by the Engineer.

The Contractor shall pump or otherwise remove any water which may be found or shall accumulate in the trenches or other excavations, and shall form all dams or other works necessary to keep them entirely clear of water while the foundations and pipes are being laid.

All paving and excavated material shall be placed so as to interfere as little as possible with public travel. At such street crossing or other intermediate points as may be directed by the Engineer the trenches shall be bridged in a proper and secure manner. The cost of all such work must be included in the price per lineal foot for the sewer.

3.71 DRAINAGE: The Contractor shall provide proper outlet for all water courses and drains interrupted during the progress of the work and replace them in as good condition as he found them.

DAMAGE TO PIPE, ETC. The Contractor will exercise great care in preserving from injury all gas pipes, water pipes, service pipes, telephone, telegraph and electric light poles encountered in the work, and is to take all risks and be responsible for all expense and damage attending the presence of water pipes, or gas pipes, poles or other obstructions not especially excluded.

Should it become necessary to change the position of water pipe, sewer drains, or poles, the Engineer shall be at once notified of the locality and circumstances, and no claims for damages arising from delay in adjusting the pipe, sewer drains, or poles shall be made.

STREET CROSSINGS, ETC. At such crossings, and other points as may be directed by the Engineer, the trenches shall be bridged in an open and secure manner, so as to prevent any serious interruption of travel upon the roadway and sidewalk, and also to afford necessary access to public or private premises.

The material used, and the mode of constructing said bridges, and the approaches thereto, must be satisfactory to the Engineer. The cost of all such work must be included intthe price bid per lineal foot for the pipe.

3.72 PIPE FOR SEWERS: Bids are requested on Vitrified Clay Pipe, and concrete pipe, Award of contract will be made on whichever material is lowest in price.

CLAY SEWER PIPE. Pipe sewers are composed of straight pieces herein termed "pipe", and of branches, bends, reducers, etc., as herein termed "specials". All specials required in the work shall be subject to the same specifications for inspection and laying as the straight pipe. All pipe and specials shall conform to the specifications of the American Society for Testing Materials, Serial designation C-13, 1935 as amended to date.

3.73 All pipes used shall be of first quality vitrified sal glazed clay pipe, well burned throughout their thickness, impervious to moisture,

of smooth well-glazed exterior and interior surfaces, free from cracks flaws, blisters, and other imperfections, true to their theoretical forms throughout their length, of thickness not less than one-twelfth their internal diameters, and shall ring clear when sounded. This requires perfect pipe, but a limited quantity of pipe (not exceeding ten percent) with slight imperfections not seriously impairing its strength or serviceability will be accepted as follows:

When the bore is practically true, the greatest diameter not being more than 5 percent longer than the shortest diameter in the same cross-section, the piece will be accepted.

If the difference is greater than 5 percent, or if the cross-section exhibits angles, sharp curves, or flat pieces, the piece will be rejected.

A pipe having only one fire crack which extends through the entire thickness of the pipe will be accepted provided that the crack is at the end of the piece and is so short that it will be covered with mortar in making the joint in the usual manner.

A single fire crack at either end of pipe which extends through one-half of the thickness of the pipe, or less, will be permitted if not more than six inches long.

A transverse fire crack in a pipe must not be longer than one-sixth the circumference of the pipe, nor deeper than one-third of the thickness of the pipe.

No fire crack of any description shall be as much as one-eighth of an inch wide at its widest point.

Pipe otherwise unobjectionable, which shows only one of the defects permitted above, will be accepted. If one pipe should show two or more of the above defects it will be rejected.

Two unbroken blisters on the interior surface of the pipe not more than one-fourth inch in height, and whose diameter is not more than one eighth the diameter of the pipe, will be permitted, provided that they can be fitted and laid so as to bring blisters on the top of the sewer.

Irregular lumps and small blisters on the outside of a pipe will not cause rejection unless in the opinion of the Engineer they are large enough to be objectionable.

A broken blister or flake whose depth is as great or greater than one-sixth of the thickness of the pipe, and whose diameter is as great or greater than one-twelfth of circumference of the pipe, will cause the pipe to be rejected.

If a piece be broken out of the rim forming the socket of a pipe, without injuring the body of such pipe, the latter shall be rejected if the gap left by said broken piece is greater than one-tenth of the circumference of the hub. If the defect is within this limit, the pipe will be accepted, provided that it can be laid so as to bring the defect to the top of the pipe.

No pipe shall be used which is intended to be straight, but varies from a straight line more than one-eighth inch per foot in length. All specials shall conform closely to their theoretical dimensions.

All pipe shall be of the hub and spigot pattern, true and circular hubs, concentric with the bore of the pipe.

Each hub shall be of sufficient diameter to receive to its full depth the spigot of the next following pipe without any clipping of either, and also leave an annular place for the mortar joint.

The faces of all spigot ends and all shoulders in the hubs must be true and be brought into good contact and all lumps on said faces must be carefully cut away before the pipes are lowered into the trench.

3.74 CONCRETE SEWER PIPE: Concrete sewer pipe shall conform to the specifications of the American Society for Testing Materials Serial designation C-14, 1935 as amended to date. All pipe shall be hub and spigot pattern. All pipe shall be subjected to tests and inspection designated in the A.S.T.M. specifications above referred to.

All concrete pipes shall be subject to inspection at the trench or other point of delivery by the Engineer. The purpose of the inspection shall be to cull and reject pipes which, independent of the tests which may have been made on specimens, fail to meet the requirements of the A.S.T.M. specifications. Concrete pipe shall be subject to rejection at the trench on account of the following:

(a) Variations in any dimension exceeding the permissible variations given in the A.S.T.M. specifications.

(b) Fracture or cracks passing through the shell or socket except that a single crack at either end of a pipe not exceeding 2 inches in length or a single fracture in the socket not exceeding 3 inches in width nor 2 inches in length will not be deemed cause for rejection unless these defects exist in more than 5 per cent of the entire shipment or delivery.

(c) Blisters where the surface is broken or which project more than 1/8 inch above the surface.

(d) Defects which indicate imperfect mixing and moulding.

(e) Cracks sufficient to impair the strength, durability or serviceability of the pipe.

(f) Variation of more than 1/8 inch per linear foot in alignment of a pipe intended to be straight.

(g) Failure to give a clear ringing sound when placed on end and dry-tapped with a light hammer.

(h) Insecure attachment of branches on spurs.

All rejected pipes shall be plainly marked by the Engineer and shall be replaced by the Contractor with pipe which meet the requirements of the specifications, without additional cost to the City.

3.75 Inspection: All work done and materials furnished shall be subject to the inspection of the Engineer and the Inspectors and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer of the rejection of such materials. And the Engineer shall have the right to so mark rejected materials as to distinguish them as such.

All pipe shall be inspected at point of manufacture in accordance with paragraph 3.02 and all pipe must bear the stencil of the Laboratory Inspecting and approving the pipe.

3.76 Fitting Pipe: Before lowering the pipe and specials, each pipe must be fitted into the socket it is intended to enter, and the top of each piece shall be plainly marked with chalk or paint, and the marked point is to be placed uppermost in the sewer.

3.77 Pipe Laying: The pipe and specials shall be so laid in the trench that after the sewer is completed the interior surface shall conform on the bottom accurately to the grades and alignment fixed or given by the Engineer.

Space between the pipe or socket or collar is to be made as uniform as possible. A gasket or jute, shall be properly caulked into each joint and the joint thoroughly filled with Portland Cement Mortar made of equal parts of cement and acceptable sand, thoroughly mixed dry and enough water added afterwards to give it proper consistency. The mortar to be made in small quantities and used as soon as made.

No joint shall be cemented until the next succeeding joint shall have been gasketed and calked. The joints are to be carefully wiped and pointed inside and out, and all mortar that may be left on the inside to be thoroughly cleaned out and the pipe left clean and smooth throughout. Every third pipe shall be filled around immediately after being properly placed and calked to prevent the moving of joints. Where indicated on plans on approved bituminous jointing material shall be used in place of cement if water is encountered.

The interior of the pipe shall be carefully freed of all dirt, cement and superfluous material of every description as the work proceeds, for which purpose a disc mold or swab, filling the entire bore of the pipe, attached to a rod sufficiently long to pass two joints from the end of the pipe last laid, shall be continuously worked through.

In trenches where water cannot be kept down without constant pumping, or bailing, or where water appears in the bell hole, the joint shall be wrapped in one thickness of cloth and securely tied to prevent washing, or such additional precaution shall be used as required by the Engineer, but no extra compensation shall be allowed.

.77 LEAKAGE. In no stretch of sewer between any two adjoining manholes shall the leakage of ground water amount to more than three gallons per foot of pipe per day. In case the leakage exceeds this amount, the sewer shall not be accepted until so repaired that it will comply with the above requirements.

.78 BACKFILLING. As soon as any joint has properly hardened, loose, fine earth or sand shall be filled around the pipe for one-half its perimeter and shall be carefully compacted with a hand rammer until the pipe has a uniform solid bed. The trench shall then be filled with earth or sand and carefully tamped for the depth of one

foot above the top of the sewer. No stones shall be allowed in the trench within one foot of the top of the sewer. Utmost care will be taken not to disturb the pipes by stepping on or near them or by throwing filling on them from above.

In completing the backfilling of the trenches care must be taken that the earth shall be well packed. Where the trenches are under or along the pavement, walks or curbing, and in streets ordered paved, or that may hereafter be ordered paved, the earth shall be deposited in layers not exceeding six (6) inches in thickness, and each layer shall be thoroughly rammed in a manner satisfactory to the Engineer, or Inspector, or if he shall so direct, water shall be used and the remainder of the trench filled by puddling. No water shall be turned into the trench for flooding until the cement has been allowed to set for at least twenty-four (24) hours. The trench must be kept back-filled within two hundred (200) feet of the pipe laying.

3.79 CEMENT. Portland Cement only shall be used throughout the work where cement is required, except as otherwise specified.

All cement must be protected from the weather by water-tight buildings, and when delivered along the line of trench shall be kept dry by the Contractor and must not be placed upon the ground without blocking.

3.80 SAND. Only clean sand, acceptable to the Engineer, shall be used. (See concrete specifications for details.)

3.81 MORTAR. The mortar shall be composed of one part by measure cement, and one part by measure of sand, and must be thoroughly mixed A moderate amount of water is to be added and the whole to be thoroughly worked and mixed. The mortar shall be freshly mixed and only in sufficient quantities for the work in hand, in proper boxes for the purpose. No mortar shall be used that has begun to set or has become hard.

3.82 CONCRETE. All concrete in manholes, piers and appurtenances shall be Class "B". All concrete flush tanks shall be Class "A". (See concrete specifications for details.)

3.83 CLOSING PIPE. When the work of pipe laying is suspended, either for night or at other times, the end of the sewer must be closed with a tight cover. The Contractor will be held responsible for keeping the sewer free from obstructions.

3.84 CAST IRON PIPE. Wherever the pipe is liable to injury or is exposed as in crossing ditches or branches, cast iron pipe with lead joints supported by brick or concrete piers shall be used.

The pipe is to be standard quality, weight adapted to 43 pounds static pressure, and will be paid for by the foot. The piers will be paid for by the thousand brick, or by the cubic yards of concrete. The two items shall constitute the payment for laying cast iron pipe.

3.85 TESTING AND CLEANING. Before acceptance of the sewer system, same shall be tested and cleaned under the direction of the Engineer and to the Engineer's satisfaction. Where any obstruction is met, the Contractor may be required to clean the sewers by means of rods or swabs or other instruments. The pipe line shall be straight and show a uniform grade between the manholes.

3.86 MANHOLES AND FLUSH TANKS. Manholes and flush tanks shall be constructed at such points as may be designated according to plans and directions given. The bottom shall be of Class "B" concrete, and the wall will be of brick masonry, except when otherwise shown on the plans, and the cover of cast iron placed on a cast iron frame above the brick work. In all cases the channel shall be smooth and properly rounded, Special care must be exercised in laying the channel and adjacent pipes to grade.

When directed by the Engineer the first length of pipe for the lateral sewers of such size as may be designated, shall be inserted and laid to proper grade and alignment; and the connecting channel shall be thoroughly made and properly curved. The stub end of the lateral sewers shall be plugged and cemented. The cost for furnishing and laying this pipe shall be included in the price paid for the manholes. The connection of the sewer with the wall and the channel of the manholes shall be tight and smooth.

The bottom shall be built of concrete and the walls of the manhole shall be built of whole hard burned brick of good quality laid in cement mortar made of one part best Portland cement and two parts clean sharp sand. Immediately before laying, the brick shall be thoroughly saturated with water. Every brick shall be carefully imbedded in mortar on its bottom and sides, and the walls shall be thoroughly plastered on the outside with a smooth coat of pure cement mortar.

The castings shall conform to the drawings furnished or shall be of a pattern approved by the Engineer.

They shall be of first quality soft gray iron, without the admixture of inferior metal. They must be whole and free from defects. Manhole covers shall be solid except in special cases where the Engineer shall specifically order perforations. The top of the manhole shall be left at grade as given by the Engineer.

Steps made of steel shall be placed in the manholes as shown on the plans.

3.87 House Connections: On all sewer lines, laid on streets, unless otherwise shown on plans, 4" Wyes shall be inserted at all buildings and at all vacant lots, and at such other points as may be designated by the Engineer. The approximate number of Y branches required is shown in the proposal.

All branches thus inserted shall be closed by vitrified stoneware covers or plugs. After the cover is placed in its proper position it shall be covered with a layer of clay over which shall be spread a layer of cement mortar sufficient to hold it securely in place.

3.88 Water Connections for Flush Tanks: The Contractor shall furnish and install complete connection for supplying water to flush tanks. These connections shall consist of 1" Type K copper pipe, terminating in a 3/4" corporation cock at the main, and a one inch bronze gate valve, equipped with hand wheel, at the flush tank.

Estimated quantities required are shown in the the proposal.

The Contractor shall also furnish and install flap gate shown on plans, but these gates shall be included in the price bid for flush tanks.

3.89 Measurement for payment: In determining the linear feet of sewer laid the Engineer will measure along the center line of pipe from center to center of manhole, without deducting for length of Y branches. The Contractor's bid on Items 8 and 10 should therefore represent the additional cost of Y branches over straight pipe.

3.90 Rock Excavation: The unit of measurement for rock excavation in trenches shall be one linear foot by one foot in depth.

3.91 Award of Contract: Contract will be awarded to the lowest responsible bidder for the complete work of Division 1. In determining the lowest bidder that type of sewer pipe will be selected which is lowest in cost.

Should the total cost of sewer extension exceed the funds available, the owner reserves the right to eliminate a sufficient number of sewer lines to bring the cost within the funds available and in making these reductions to eliminate any line or lines which it may elect.

ADDENDA

Paragraph 3.02:

Cement (a) add: "and evidence of shipment from Mill within 3 months of delivery on job.

Paragraph 3.18:

Change last line to read "for same as provided under extra work, paragraph 2.20.

Paragraph 3.21:

Line 6 & 7 change to read as follows: "where so required broken stone furnished and paid for as extra work under paragraph 2.20, shall be placed, etc."

SECTION 4

DETAILED SPECIFICATIONS

Division 1

TANK FOUNDATIONS, VALVES, ETC.

4.01 Work to be Done: The Contractor for Division 1 shall furnish all labor and materials and construct concrete foundations for the elevated tanks and shall construct the pipe lines, and install altitude valves.

4.02 Foundations: Material to be encountered in excavation is clay. The Contractor shall excavate to the depths required by the Engineer. Excavations will be computed for payment to the outside limits of footings. Complete foundation drawings will be furnished by the Owner after award of contract.

All concrete shall be Class A and shall be in accordance with the general specifications.

4.03 Cast Iron Pipe: All cast iron pipe shall conform with Federal Specifications WWP-421 Bell and Spigot and shall be Class 150. The Contractor shall connect to foot ell furnished and installed by the Contractor for Division 2. All pipe shall be laid in accordance with the General Specifications therefor. In general, the minimum depth of cover shall not be less than thirty inches over the top of the bell. Where necessary, however, to go deeper to avoid obstructions or prevent summits which would entrap air, the Contractor may be required to go deeper without additional compensation.

4.04 Cone Altitude Valves: The Contractor for Division one shall furnish and install two cone type altitude valves. One valve 10 inches in diameter shall be installed in the 10 inch line leading to the new 250,000 gallon tank and one valve, 10 inches in diameter shall be installed in the 16 inch line leading to the old tank on the City Hall lot.

The cone valve shall consist of a body or casing of semi-steel with bronze or monel metal seat rings raised not less than 1/8 inch, also a plug of semi-steel

with circular water way and with four bronze or monel metal seating rings lapped in and raised not less than 1/8 inch, and bronze bushed.

The valve shall unseat axially, rotate without friction and seat axially. The operating mechanism shall be enclosed in a substantial casing rigidly attached to the valve.

It must be possible to remove the plug at any time without dismantling the control mechanism or pilot valve or to remove or service the pilot valve and control mechanism with the cone in any position.

The hydraulic cylinder shall be semi-steel, bronze lined and designed to operate the valve with a minimum pressure of 30 lbs. per square inch.

Control shall be obtained through spring loaded diaphragm, and four way pilot valve and must be capable of controlling the water level in the tank, within six inches. When operating the valve shall be either full open or full closed.

Four way valve must be of tight seating poppet design.

The valves shall be placed in a concrete valve pit as shown on plans and connection shall be made to the tank riser.

Materials and workmanship shall be first class in every respect.

The maximum operating pressure will not exceed 125 lbs. per square inch but the valve shall be tested to 250 lbs.

Valve pits shall be constructed as shown on plans and payment will be made in accordance with prices bid in the proposal sheet.

4.05 Gate Valves: All gate valves shall be iron body bronze mounted double disk valve suitable for 150 lbs. working pressure and 300 lbs. test, and must conform to the specifications of the American Water Works Association. Only valves of makes now used in the present distribution system will be accepted. All valves shall be provided with valve boxes.

4.06 Hydrants: Hydrants shall be of the compression type with minimum 4 inch valve opening and six inch bottom connection, two way standard nozzle and steamer connection. Hydrants shall conform to the specifications of the American Water Works Association and shall be of makes now used in the distribution system.

DIVISION NO. 2

ELEVATED TANK

4.07 General: The Contractor shall furnish and erect, on foundations furnished by the Owner, an elevated tank having a capacity of 250,000 gallons. The height of the tank from base of tower to overflow shall be 132 feet and the distance between overflow and bottom of tank in which the net capacity is stored shall not exceed 22 feet.

4.08 Roof: Shape of roof shall be elliptical or oval, of pleasing appearance and capable of supporting specified loads. The lower section of the roof may be utilized for water storage. Roof plates shall be not less than 1/4 inches thick, of copper bearing steel, and shall be provided with a manhole not less than 20 x 22 inches, with a rainproof steel cover and an ornamental finial, provided with screened opening for venting tank.

4.09 Tank: The tank shall be cylindrical and shall have an elliptical or suspended bottom, with or without beams. If beam supported, the beams shall be built integral with the bottom plates. The structure may be of either riveted construction or may be welded.

4.10 Plate Thickness: Minimum thickness of plates in contact with water shall be 5/16 inch.

4.11 Balcony: Provide balcony not less than 30 inches wide around circumference of tank, with steel handrail not less than 30 inches high.

4.12 Drawings: The Contractor shall furnish with his proposal general plan showing sizes and weights or thickness of all members, stress sheet and foundation plan.

Before fabrication, the Contractor shall submit to the Engineer detailed plans, showing all details of construction and these plans must be approved by the Engineer before the work proceeds.

4.13 Loads: The structure shall be designed to safely withstand the following loads and forces acting separately or in combination.

4.14 Dead Load: The weight of all permanent construction and fittings.

4.15 Live Load: The weight of water in the tank when overflowing and a wind pressure of 30 lbs. per square foot on a vertical plane surface. In calculating the wind load on the cylindrical surface, six-tenths of the above pressure shall be applied to the total area of the vertical projection and the point of application of the load shall be at the center of gravity of the projection area.

4.16 Quality of Material: All metal in the structure shall conform to latest specifications of the American Society for Testing Materials, Designation A-7, unless otherwise specified.

4.17 Bottom Plates: Bottom Plates shall be of pressing steel properties same as rivet steel.

4.18 Test Reports: Test reports shall be made in accordance with Paragraph 3.02 of these specifications.

4.19 Unit Stresses: Unit stresses shall not exceed the following:

Tension in Net Section Shell Ring	12,000# per sq. in.
Bottom Plates	12,000# per sq. in.
All other plates	12,000# per sq. in.
Structural Shapes and Tower Rods	15,000# per sq. in.
Compression in columns and struts	$\dfrac{18{,}000}{1 + \dfrac{L^2}{18{,}000\ R^2}}$
Main Members	$\dfrac{L}{R}$ 100
Secondary Members	$\dfrac{L}{R}$ 150

4.20 Bending Extreme Fibres: Rolled shapes and built-up section:

Net Sections	18,000 lbs. per sq. in.
Pins	27,000 lbs. per sq. in.

4.21 Shearing: Power driven rivets in tank - 9000 lbs. per sq. in.

Pins and tower rivets - 12000 lbs. per sq. in.

4.22 Bearing: Power driven tank rivets - 13,500 lbs. per sq. in.

4.23 Initial Stress: Adjustable tension members:

Assume 3000 lbs. tension per square inch.

4.24 Design and Workmanship:

Description: All design and workmanship shall be equal to the best practice in modern tank shops and in all cases shall be done by experienced workmen.

4.25 Abutting Ends of Compression Members: All abutting ends of compression members shall have their ends milled to secure a uniform bearing.

4.26 Rivet Holes: All rivet holes shall be accurately spaced. Rivet holes shall be drilled from the solid in all plates 5/8" in thickness or over.

4.27 Scarfing of Plates: Wherever a water-tight fit is required the edges of the plates shall be scarfed.

4.28 Cold Forming: All plates in the tank, roof and riser shall be formed cold to the necessary curvature and shall be formed in a manner which will not produce uneven stresses or weaken the metal.

4.29 Making Joints Water-tight: If riveted, all seams in the tank, bottom and riser shall be made water-tight by caulking only. No foreign substance shall be put on the laps between the plates.

4.30 Welding: All welding must be done by welder operators who are thoroughly experienced in welding by the Shielded-Arc process. They must be qualified for welding under the National Board of Fire Underwriters or American Welding Society Specifications.

4.31 Legs: Distance between tower legs where connected to tank shall not exceed 20 feet.

4.32 Shapes: All structural shapes used in the construction of the tower shall be rolled shapes.

4.33 Bracing: All bracing for the tower may be either tension or compression members, or both.

4.34 Anchor Connections: Where angles are used for compression or tension

members in a tower, 75 per cent of the net section shall be considered as available where one leg is connected, and 90 per cent of the net section shall be considered as available where two legs are connected.

4.35 Compression Members: All compression members shall be so designed that all parts are open and accessible for painting.

4.36 Anchor Bolts: The Contractor shall furnish all the necessary anchor bolts for fastening the columns to the foundations. These anchor bolts shall be erected by others.

4.37 Column Bases: Column bases shall be designed so that they will not collect water or dirt. Column bases shall be so designed that the bearing pressure on the bases of the columns shall not be more than 400 pounds per square inch.

4.38 Tension Members: Tension members shall be rolled shapes, riveted in plates and connection holes reamed in the field to insure accurate fitting, or pin connected with turnbuckles provided for adjustment.

RISER PIPE

4.39 The diameter of the riser pipe shall be not less than four feet.

4.40 Manholes: The riser pipe shall be provided with a suitable manhole not less than 12 x 16 inches clear opening.

4.41 Outlet Pipe Connections: The base of the riser pipe shall be designed to connect with a standard 12 inch bell and spigot pipe. The base ell to be furnished and installed by the Contractor.

4.42 Overflow: Provide 6 inch diameter overflow of cast iron flanged pipe from top of capacity inside tank and through riser connecting to 6 inch foot ell. Overflow pipe to be securely braced and tied to tank and riser.

4.43 Washout: Provide 4 inch washout valve at bottom of riser.

4.44 Ladders: Provide ladder on one tower leg, extending from a point six feet above top of foundation to balcony. A ladder on vertical shell from

balcony to roof; a revolving ladder on roof and a ladder inside of tank from scuttle hole to riser pipe. All side bars to be not less than 3/8 inch by 2-1/2 inch flats. All rungs not less than 5/8 inch.

4.45 Gauge: Provide proper tell-tale gauge on the tank.

PAINTING

4.46 Interior Coating: All surfaces shall be thoroughly cleaned of mill scale, rust, grease and moisture or other foreign matter by approved methods immediately before applying the shop-coat.

The inside of the tank and riser plates, interior ladders and bracing, underside of metal roof and roof supports and exterior of the overflow pipe shall be given a shop-coat of bituminous solution, applied by brushing or spraying. The bituminous solution shall be brushed out smoothly and dried thoroughly before the steel is shipped.

The inside of the tank and riser pipe, interior ladders and bracing and exterior of the overflow pipe shall be given a field coat of bituminous solution, brushed on cold followed by a final coat of bituminous enamel, brushed on hot. The bituminous enamel shall be applied hot by means of Tampico fibre daubers to a thickness of approximately 1/16 inch and the daubing shall progress by means of parallel strokes, each stroke to overlap previous strokes on sides and ends by an amount sufficient to eliminate holidays. No indiscriminate smearing of the hot coating shall be permitted. The application, in the field, of all the coating materials shall be made in accordance with the manufacturer's best practice and by trained and experienced men in the employ of the manufacturer of the coatings. The underside of the roof, roof rafters, bracing, etc., shall receive two coats of bituminous priming solution instead of the hot enamel.

The bituminous solution and enamel shall be made of an all coal-tar base, without either native asphalt or asphalt obtained from petroleum, as part of the ingredients. They shall be made so as to produce a coating that will possess good adhesive qualities, will not sag or flow from a vertical surface when exposed to an atmospheric temperature of 160 degrees Fahrenheit and will not

crack, check or peel when exposed to an atmospheric temperature of 0 degrees Fahrenheit. The use of fluxing oils or thinners in the enamel to reduce cracking susceptability in cold weather will not be permitted.

The bituminous priming solution and bituminous enamel shall be BITUMASTIC 70-B Priming Solution and BITUMASTIC 70-B Enamel as manufactured by WAILES DOVE-HERMISTON CORPORATION, HILL-HUBBELL CO., or equal. The manufacturer of the bituminous priming solution and bituminous enamel must furnish proof that materials, manufactured and applied by him, have been in satisfactory service on the interior of water tanks for a period of not less than fifteen (15) years.

The application of all of the coating materials shall be made in accordance with the manufacturer's best practice and by trained and experienced men in the employ of the manufacturer of the coatings. The bidder shall state in the proposal the amount he will deduct if three coats of the best red lead and linseed oil paint containing not less than 20 lbs. of red lead per gallon of oil is applied on the interior of the tank instead of the coating specified.

4.47 Outside Painting: One coat of red lead and oil consisting of the best red lead and linseed oil containing not less than 20 lbs. of red lead per gallon of oil shall be applied at the shop. After erection, a patch coat of red lead shall be applied to all rivets and abraded surfaces. Two coats of best quality aluminum paint shall be applied to the outside surfaces.

4.48 Testing: Upon completion, the tank shall be filled with water and inspected for leaks. The Contractor shall repair all leaks or defects which may appear.

4.49 Work to be done by Others: All foundation excavation and concrete and all pipe lines, valves, etc., will be furnished and installed by others.

4.50 Sterilization: Upon completion of the work the tank riser pipe and pipe connections will be sterilized by the Water Department before the tank is placed in operation.

DIVISION 3

REFUSE INCINERATOR

4.51 Location: The incinerator shall be located on the site, sketch of which is attached hereto.

4.52 Work to be done: The work to be done under this contract consists of furnishing a complete design for the building, furnace, preheater, ash tunnel, chimney and all appurtenances thereto, constructing an incinerator plant having a capacity of not less than 75 tons per 24 hours, complete in accordance with these specifications and the design drawings, including grading of roadways and guaranteeing the design and construction to be performed in a manner and in accordance with the requirements of those specifications. The design drawings shall conform to the following maxima and minima.

1. The number of cubic feet of combustion chamber volume per ton of refuse consumed in 24 hours at normal rated capacity shall be not less than 15.

2. The number of cubic feet of furnace volume above the grates per ton of refuse consumed in 24 hours at normal rated capacity shall be not less than 11.

3. The number of pounds of air provided per pound of refuse to be consumed at normal rated capacity shall be not less than four.

4. The effective grate area upon which final combustion takes place, measured on the horizontal projection shall be equal to approximately 1.2 square feet per ton of refuse to be destroyed per 24 hours.

5. The drying hearth shall have an area, measured on the horizontal projection of approximately 0.6 square feet per ton of refuse destroyed per 24 hrs.

6. The combined total horizonta. projected area of the drying grate and the effective burning grate shall be such that the inside horizontal area of the furnace shall be not less than 1.8 square feet per ton of refuse destroyed at normal rated capacity in 24 hours.

7. The net effective preheating surface shall not be less than 90 standard carborundum tubes as hereinafter described.

8. The net inside area of the chimney at the top shall be not less than 0.25 square feet per ton of refuse to be consumed in 24 hours at the normal rated capacity.

9. The minimum stoking aisle clearance as measured on a perpendicular, from the outside face of the furnace to the inside face of any building wall, partition or obstruction of any kind, except a pilaster, shall be equal to the depth of the furnace inside the furnace walls, plus the total thickness of the front furnace wall, plus 4 feet. The depth of the furnace shall be considered as the distance from the inside face of the front wall of the furnace to the bridge wall, or rear wall. Where stoking doors are located on both sides of the furnace and directly opposite each other the depth shall be considered as one foot more than half of the inside width of the furnace. Buckstays may intrude into this space.

10. A furnace, combustion chamber and preheater will be considered one unit. There shall be a space of not less than six (6) feet between the side wall of any unit and any building wall to provide a passageway from the stoking area to the rear of the building. There shall be a space of not less than three (3) feet between the end or rear wall of any unit and the rear wall of the building. Buckstays and building columns may intrude into these spaces.

11. The minimum thickness of the firebrick lining where the gases come in contact with the lining shall be 9" except on the floor of the combustion chamber or flues, where the minimum thickness shall be 4-1/2".

12. The minimum thickness of insulation for any firebrick wall, arch or floor shall be 2-1/2 inches. The minimum thickness of insulation for any side wall inside of the building shall be 4-1/2" with steel plate housing and not less than 2-1/2" with a 12" common brick or 12" concrete housing on the exterior of the building.

13. The minimum height of stack will be 100 feet measured above the average elevation of the grates.

14. The minimum height of the stoking floor above the floor of the ash tunnel shall be 12 feet. The minimum clearance of any floor beam above the floor of the ash tunnel shall be 9 feet.

15. The minimum height of the charging floor above the stoking floor shall be 14 feet.

16. The minimum clearance from the charging floor to the lowest part of the roof truss or beam shall be 16 feet.

17. The building shall completely house the furnace, combustion chamber, preheater and flues exclusive of that flue which leads directly to the stack.

18. All walls of the stoking floor shall be carried in the same vertical plane to the roof. No lean-tos may be provided.

19. The locker room shall have a minimum floor area of 80 square feet and the toilet room shall have a minimum floor area of 80 square feet.

20. The minimum clear width of any stairs shall be 3 feet.

21. The minimum width of any doors through which trucks shall pass shall be 14 feet. The minimum height shall be 14 feet.

Capacity: The furnace shall be capable of incinerating not less than 75 tons of refuse containing 65% of garbage and 35% of rubbish in 24 hours without the use of additional fuel, the moisture content not to exceed 55% by weight of the total mix. The non-combustible materials shall not exceed 15% of the rubbish component by weight.

4.53 Drawings: The contractor shall submit with his proposal outline drawings showing the plant in sufficient detail to enable the Engineer to determine the general character of the proposed construction. Within thirty (30) days from date of approval of this contract by the City, the contractor shall submit for the approval of the Consulting Engineer, drawings showing the complete layout of building furnace, preheater, flues, chimney and appurtenances to enable the Consulting Engineer to give his approval to the general plan and he shall submit

working drawings of the building, ramp, furnace, preheater, flues, chimney and appurtenances before proceeding with the construction thereof.

The drawings shall be accurate and distinct and shall show all the working dimensions, the kind of material to be used and the character of workmanship on furnaces to be given to each part, the arrangement of all parts and all dimensions required for the erection of the work. Three sets of prints shall be furnished, and if required, the drawings shall be revised to meet the approval of the Engineer. Two sets of drawings will be retained, the third set, after approval will be endorsed by the Engineer and returned to the contractor.

In general, these specifications are drawn for furnace of brick construction, steel jacketed, "high-temperature" type, with a drying hearth in the same plane (or approximately so) as the burning hearth.

4.54 Choice of Apparatus: In all cases where the contractor is not required to furnish and erect a particular type of accessory apparatus but is allowed to furnish another type of accessory apparatus equally satisfactory to the Engineer, he shall submit to the Engineer drawings and descriptions of such apparatus which he proposes to install and these drawings and descriptions shall be approved by the Engineer before said accessory apparatus is ordered or purchased by the contractor.

INCINERATOR FURNACE STRUCTURE

4.55 General Description: The contractor will be required to design the furnaces along the general outlines specified herein and prepare plans in detail showing all parts of the furnace, combustion chamber, preheater, flues, charging openings, ash hoppers, dampers and all other items necessary to make the furnace complete. The contractor shall prepare complete specifications for any items not contained in the owners specifications for the furnace. Both the plans and specifications prepared in accordance with the above instructions shall be submitted by the contractor with his bid, in order to have his bid considered.

4.56 Type: The furnace shall be of the "high-temperature" brick type, top feed, incorporating the use of forced draft. Each furnace shall be constructed with not less than 3 cells having a common furnace chamber over the cells, with drying hearth continuous throughout the furnace chamber. Two separate rectangular furnaces in line will be considered, but in such furnaces the total inside furnace area must be equivalent to the combined area of the burning grates and the drying hearth as set forth under "Maxima and Minima." No other types will be considered as coming within the scope of these specifications.

The combustion chamber may be placed in the back of the furnace with bridge wall extending lengthwise and parallel to the furnace chamber front, or it may be placed at one end of the furnace with bridge wall between.

The maximum operating temperature which the furnace shall be designed to develop shall be not less than 2000 degrees Fahrenheit.

There shall be not less than 3 charging holes, or one charging hole for each cell.

There shall be provided proper flues connecting the furnaces, preheater and stack. Each cell shall be separately controlled as to stoking and draft control. Each cell shall have its own individual ash hopper.

The furnace chamber, combustion chamber, preheater and flues shall be structurally free and separate from the charging floor, walls and columns of the building, except that the stoking floor may be carried on the same set of columns and beams which support the furnace, provided that suitable provisions are made for taking care of expansion around the furnace structure.

4.57 Normal Rated Capacity: The normal rated capacity of the furnace shall be 75 tons in 24 hours. The plant and furnace shall be so designed that the full normal rated capacity can be continuously maintained without interruption, under normal conditions.

Normal operating conditions shall be defined as operation with continuous charging with the furnaces burning at normal rate, with temperature in combustion chamber at 1600 degrees Fahrenheit, and all volumes, velocities, areas and

ports shall be designed accordingly.

4.58 Grate Area: The net effective grate area shall be not less than 90 square feet, exclusive of drying hearth, which area shall be measured as projected on a horizontal plane. All burning grate surface shall be within a limit of 6 feet from the inside face of the furnace wall in which stoking openings are located.

4.59 Drying Hearth Area: The furnace shall have a drying hearth, with a total area, measured as projected on a horizontal plane, of approximately 50 percent of the grate area, which shall be in addition to the effective grate area.

The combined area of the effective grate area and the drying hearth shall be such as to give the inside of the furnace, measured as projected on a horizontal plane, a total area of not less than 135 square feet.

FURNACE CHAMBER

4.60 Volume: The internal volume of the furnace chamber shall be not less than 825 cubic feet, measured below the bottom surface of the arch and above the grate level and drying hearth level. This volume shall be exclusive of all door openings and of the space above the bridge wall.

The furnace chamber shall be defined as that portion of the furnace structure above the stoking floor level, which includes the grates, drying hearth and bridge wall, together with the exterior walls enclosing same and the arch over same.

4.61 Arches: The furnace chamber arches shall be of the full semi-circular, sprung or flat suspended type. The depth of refractory block shall be not less than 9 inches for semi-circular or sprung arches whose span is not over 8'6" and not less than 13-1/2" for spans above 8'0", and it shall not be less than 10" for flat suspended arches.

In the case of full semi-circular, sprung and flat suspended arches suitable provisions shall be made for resisting the horizontal thrust by means of buckstays with ties at both top and bottom. Provision shall also be made to

provide for vertical movement due to expansion and contraction.

In the case of flat suspended arches expansion joints between arch blocks and all walls shall be provided. The entire arch shall be suspended from independent structural steel supports. The structural steel supports shall carry the arch load to the outside structural supporting members of the furnace. All load from the arch must be transferred into buckstays without depending on the masonry walls for support. All castings necessary for the support of the arch refractories, and transfer of their weight to the structural steel supports, shall be provided and erected by the contractor.

Top of all arches shall be covered with 2-1/2 inches of solid insulating brick or blocks.

4.62 Charging Holes: Charging holes of not less than 30 inches square or equivalent area, shall be provided through the furnace chamber arches. There shall be one charging hole for each cell. Each charging hole shall have a cast iron frame of heavy section and shall be provided with a heavy cast iron cover of the sliding swinging type. The cover shall be made of at least 1/2 inch stock and the frame and cover shall be machined where they come in contact in order to secure a tight fit. The cover shall be lined with insulating cement, as "Sil-O-Cel-C3" or equal.

Charging hole frames shall be suspended from structural supporting members and not depend on the arch masonry or the wall masonry for support. The charging openings below the castings shall be suitably designed, using fire bricks or special plastic refractory so constructed as to give strength and rigidity to openings, and so installed as to permit of repairs at minimum expense.

A charging hole for the incineration of animals shall be provided together with a hoisting arrangement which will permit the animal to be lifted from the truck and discharged into the furnace.

4.63 Walls: The walls of the furnace chamber shall be of the built-up type,

constructed of firebrick lining, backed up with solid insulating brick, with an outside covering of at least 1/4 inch steel plate, provided with proper and approved horizontal stiffener girts. Walls 9 feet high or less shall have a firebrick lining 9 inches in thickness. Walls more than 9 feet high shall have the firebrick lining increased to 13-1/2 inches in thickness below a point 9 feet from the top of the wall.

No firebrick wall, except a vertical deflector or baffle wall, shall be exposed to heat on both sides.

The bridge wall shall be not less than 18 inches in thickness above the grates or hearth line.

The insulation backing for the firebrick lining shall be not less than 4-1/2 inches in thickness. The water jacketed furnace shall be completely enclosed with not less than 3" of suitable and approved insulating materials properly applied and secured.

4.64 Grates: The main part of each grate shall consist of stationary cast iron grate bars. The total openings through the grates for passage of air shall be not less than 40 percent of the grate area. "Herringbone" grates will not be accepted. Each cell shall have a dumping section which shall have a net total clear opening of not less than 4.5 square feet. No dimension in the opening shall be less than 18 inches.

The dumping sections shall be operated by suitable mechanism which will insure easy operation for one man. Dumping dead plates within the furnace firing door will not be accepted as a substitute for dumping grates.

The grates shall be supported on heavy cast iron I beams and channels.

Grates shall have suitable provision for expansion and contraction. They shall be designed to reduce to a minimum the adherence of clinkers to the furnace walls where the latter meet the end grate bars.

4.65 Drying Hearth: The furnace shall be provided with a drying grate or drying hearth for storage of wet garbage and rubbish. The drying hearth shall be

constructed of 9 inches refractory brick, by laying two courses of brick on edge, or 4½ inches refractory brick, if one course of brick is used with 2½ inches of insulation.

4.66 Stoking Doors: The furnace shall be provided with 3 stoking doors, to provide easy access for stoking.

All stoking doors shall be of guillotine type with 2 foot 6 inch square or equivalent openings. They shall be of metal at least 5/8 inch thick in body, with heavier metal in flange forming door perimeter. They shall have webs cast in them, be of sufficient depth for a 4 inch thick refractory lining and shall be provided with such a lining. Each stoking door shall have a secondary 9 x 9 inch or equivalent, hinged, heavy flap door in center, which will close by gravity.

Main stoking doors shall fit against heavy independent cast iron frames, with all contact surfaces between door and frame accurately machined. These frames, consisting of jambs, arches and sills against which doors fit, shall be separate from main door frame casting and shall be readily replaceable. Metal in door frames shall be at least 1-1/8 inches thick.

Guillotine doors shall be fitted with counterweights and cables, passing over roller bearing sheaves. Counterweights shall be adjustable and doors shall be counter-balanced and adjusted so that they may be readily operated by hand.

Doors shall be provided with heavy latches, operating against beveled seats for closing them tightly. Door frames shall be carried on outside structural supports of incinerator and shall have no supporting bolts passing through or anchored to the furnace brick work.

4.67 Ash Pit Doors: Ash pit doors shall be provided, below the level of the grates and above the level of the stoking floor, one directly beneath each stoking door. Ash pit doors shall be hinged with heavy frame of at least 5/8 inch metal and planed seats. They shall be provided with latches for closing

similar to those described under stoking doors.

4.68 Peep Holes: A peep hole shall be provided in the end wall of the furnace chamber. These peep holes shall have a cast iron frame with a steel thimble and pivoted cover.

4.69 Combustion Chamber:

4.70 Volume and Dimensions: The internal volume of the combustion chamber shall be not less than 1125 cubic feet. The space included shall be all that space above the top surface of the refractory floor, measured up to the bottom surface of the arch. The velocity of the gases in the combustion chamber shall not exceed 15 feet per second and the minimum dimension of the combustion chamber shall not be less than 5'o".

The combustion chamber shall be defined as that portion of the furnace structure including walls and arches, which immediately joins the furnace chamber, and into which the products of combustion created in the furnace chamber are first discharged. No flues, flue enlargements, ports or space above the bridge wall will be considered as combustion chamber, nor will any credit be given to combustion chamber space for any space in flues, nor space occupied by interior baffle or division walls.

4.71 Arches: The combustion chamber arches shall be of the same type and construction as specified for the Furnace Chamber Arches.

4.72 Walls: The walls of the combustion chamber shall be of the same type and construction as specified for the Furnace Chamber Walls, except that the fire-brick lining shall not be less than 13½" thick for the full height.

4.73 Floor: The floor of the combustion chamber shall be paved with 4-1/2 inches of fire brick, below which shall be 2-1/2 inches of solid insulating brick.

4.74 Cleanout Door: The combustion chamber shall be provided with a cleanout door with frame, with 2 foot by 2 foot 6 inch opening or equivalent. Door and frame shall be of cast iron, with 3/4 inch minimum metal thickness in door and

one inch metal thickness in frame. Contact surfaces shall be machined and door shall be ribbed and lined with 4 inches of refractory. Door shall have heavy latches with beveled seats for closing tightly. Doorframe shall be carried on outside structural supports of incinerator and shall have no supporting bolts passing through or anchored to furnace brick work.

4.75 Peep Hole: A peep hole shall be provided in the end wall of the combustion chamber. Peep hole shall have a cast iron frame or thimble and a pivoted cover.

4.76 Preheater: The plant shall be provided with a preheater through which a quantity of flue gas shall be passed for heating the air supplied for combustion. Dampers shall be provided in the inlet flues so that a sufficient quantity of flue gas will be passed through the preheater to produce an average temperature of not less than 400 degrees Fahrenheit in the air as it leaves the preheater.

The preheater shall be of carborundum tube type. No other type of preheater will be considered.

4.77 Carborundum Tube Preheater:

4.78 Description: Carborundum tube preheater shall be of the two-pass air type and shall be arranged with the tubes horizontal. The gases shall pass around the outside of the tubes and the air for combustion shall pass through the tubes. The center line of the bottom row of tubes shall be not less than 1'5½" above the top of the firebrick floor of the preheater chamber. Provisions shall be made to afford a clear space of not less than 4'6" on one side of the preheater housing wall to permit the free withdrawal of tubes.

4.79 Tubes: The recuperator shall have not less than 90 silicon carbide tubes each 5-3/4" outside diameter by 4'4" long, properly arranged to heat the forced draft supply from 70° to 400° F.

4.80 Core Busters: Each tube shall have a suitable corebuster to increase

its rate of heat transfer per tube by raising the velocity of the air flowing inside the tube and adding to the effective heating surface beyond the conditions existing with an empty tube. The flue gases shall travel outside the tubes.

4.81 Wall Blocks: The tubes shall be carried in special fireclay tube terminal wall blocks and sealed in these walls against leakage by a caulking cement (as Weber's No. 48 cement, or an approved equal thereof) that retains its resilicency at the air temperature involved. Every tube shall be laid in the wall blocks so that there is no binding or pinching of the tubes by the blocks and provision shall be taken to prevent any hard setting cement from holding the tubes rigidly in the blocks. The joints between the tubes and their blocks shall be sealed against leakage only by the resilient cement referred to.

4.82 Roof: The preheater chamber shall be covered over with a cast iron or refractory roof. If a cast iron roof cover is used it shall be suitably insulated on the under side and shall be built in sections.

4.83 Flues:

4.84 General Arrangement: There shall be provided, in connection with each furnace, all flues necessary to pass the gases from the combustion chamber to the chimney, with provision for causing whatever part of the gases as is required to flow through the preheater and from thence to the chimney. A by-pass flue shall be provided to pass the gases directly from the combustion chamber to the chimney without passing through the cast iron preheater. Dampers shall be provided to control the flow from the combustion chamber and the flow into the preheator chamber. The exit ports from the combustion chamber to the preheater gas chamber and by-pass flue shall be located at the bottom or end of the combustion chamber so that its function shall have been entirely completed.

4.85 Areas: The net cross sectional areas of all flues or ports shall be calculated upon the following basis, the measurement to be taken in a plane perpendicular to the flow of the gases:

100% of Gases - Preheater Inlet Flue at 1600°F (Velocity - 35 ft/Sec)
100% of Gases - By-pass Flue at 1600°F (Velocity - 30 " ")
100% of Gases - Header Flue (if any) at 1200°F (Velocity - 25 " ")
100% of Gases - Main Flue to Stack at 1200°F (Velocity - 25 " ")

4.86 Arches: The arches over all flues shall be of the same type and construction as specified for the Furnace Chamber Arches. On all flues outside of the building a concrete slab shall be provided over the top of the arches, supported on the exterior walls of the flue and with a minimum clearance between the top of the insulation over the arch and the under side of the slab of not less than 1 foot.

4.87 Walls: The walls of flues inside the building shall be of the same type and construction as specified for the Furnace Chamber Walls, but the walls of flues outside the building shall be of the type with outside covering of 12 inches common brick or concrete and provided with necessary stays, top and bottom tie rods.

4.88 Floors: The floors of the flues shall be as specified for Combustion Chamber Floors.

4.89 Cleanout Door: A cleanout door shall be provided in the main stack flue. This door shall be of the size and type as specified for Combustion Chamber Cleanout Door in Section 4.74.

4.90 Dampers: The flue system for each furnace unit shall be provided with proper control dampers; one damper in the flue entering the preheater, and one damper in the by-pass flue. The dampers shall be duplex corrugated, high temperature alloy sheets supported in an alloy steel frame to withstand the high temperature to which it will be subjected. Alloy shall be "Duraloy" as manufactured by the Duraloy Company, or equal. The dampers shall be so installed as to operate freely under all conditions. Each damper shall be operated with a worm driven winch located in a suitable place on the stoking floor. All sheaves shall be of the roller bearing type.

4.91 Ash Hoppers: The contractor shall furnish and install individual ash

hoppers for each cell, or not less than 3 hoppers for furnace. Ash hoppers shall be of 5/16 inch copper bearing steel plates with welded seams and thoroughly stiffened. Hoppers shall be lined with 2-1/2 inches of vitrified paving brick, set in cement grout and presenting a smooth surface. Sloping sides of ash hoppers shall be not less than 60 degrees from the horizontal. The total net capacity of the hoppers shall not be less than 2.1 cubic feet per ton of rated capacity for 24 hours.

Each ash hopper shall have hand operated cast iron, sliding or pivoted gate, with an opening not less than 5 square feet. Sliding gates shall be rack and pinion operated with handwheel, located well to one side of gate to clear trucks into which ashes are discharged. Gates shall be readily operated by one man. Floors of ash tunnel shall be paved with vitrified brick.

4.92 Air Admission Valves and Air Ducts: An air duct shall be provided which will carry the forced draft from the fan to the preheater and thence into the space below each grate. This air duct shall be provided with proper control valves, one for each cell or one above each ash hopper. The control shall be from the stoking floor, within easy reach of the stoker. Each control valve shall have a device so that the valve may be set at any desired opening. The inlet side of the fan shall be connected to a louvre in the building wall, by means of a metal duct, so that air for the forced draft may be taken from the outside. The air duct for the carborundum preheater shall be so arranged and equipped with control valves that any or all of the forced draft may be passed through the preheater, or the preheater may be by-passed completely and the forced draft passed directly from the fan to the space below the grates.

The control valves shall be connected to the outlet of the pre-heater throug a 16 gauge steel air duct. The area of this air duct shall be not less than 1-1/4 times the outlet of the forced draft fan. The air duct shall have connections made with suitable angle iron flanges bolted together. All shop joints in the air duct shall be riveted or welded. The air duct shall be provided with

suitable supports or hangers. The construction shall be air tight.

4.93 Buckstays: The furnace chambers, combustion chambers, preheater chambers, and all flues shall be provided with structural steel buckstays. Buckstays shall consist of single I-beams or pairs of channels. In the case of I-beams each member shall be not less than 8 inch 17 pound section. In the case of channels each member shall be not less than 8 inch 11.5 pound section. Wherever buckstays are more than 14 feet long, the sizes of each member shall be increased. The I-beams shall become not less than 12 inch 28 pound sections, and the channels not less than 12 inch 20.7 pound sections.

The buckstays shall be properly tied together at both top and bottom with tie rods of not less than 1-1/4 inches in diameter. In lieu of the top tie rods, some form of structural steel arch support framing may be used to provide the top ties for buckstays.

Belt channels, angles or other suitable horizontal structural members shall be provided to take the load of all arch supports and carry it into the buckstays. Buckstays shall be spaced at approximately 7 feet center to center.

4.94 Steel Jacket: The entire outside surface of the furnace chamber walls, combustion chamber walls, preheater chamber walls and all flue walls inside the building shall be covered with steel plate jacket not less than 1/4 inch thick, properly stiffened with angles or tees, and straps and bolted to the buckstays.

4.95 Tools: A complete set of firing tools shall be furnished for each furnace. Each set shall consist of 3 hauling down rakes, 1 spring steel slice bar, 1 clinker bar, 1 ash pit hoe, and 1 can rake.

4.96 Forced Draft Fan and Motor: A forced draft fan shall be provided. The fan shall be capable of delivering into the chamber 5600 cubic feet of air per minute (at 70 degrees Fahrenheit). This delivery shall be reached under the pressure conditions imposed by the contractor's preheaters, system of airducts, and with an average fuel bed on each cell of 10 inches, but under no conditions

shall the working pressure be less than 5" water pressure. Fan shall operate at a speed not to exceed 1800 R. P. M.

Fan shall be equal in quality and performance to those manufactured by the American Blower Corporation, B. F. Sturdevant Company, or Buffalo Forge Company, and the contractor shall state in his bid the name of the manufacturer whose equipment he intends to use. The fan shall be of the single inlet type with full housing. There shall be two roller bearings, equal in quality and performance to Dodge or Timken, in the fan shaft. These bearings may carry the wheel overhung, or one may be of the outboard type. The fan shaft shall be direct connected to the motor by means of a flexible coupling. The housing, bearings and motor shall be rigidly mounted on a structural steel sub-base. The fan housing shall be of the horizontal split type rigidly constructed with proper angle iron reinforcement.

The fan shall be direct connected to variable speed motor at not to exceed 1800 R. P. M. full load speed. Motor shall have ball bearings. The current available will be 220 volt, 3 phase, 60 cycle, alternating. Motor shall be designed to operate with a temperature rise of not to exceed 40 degrees C. at continuous operation. Motor shall meet all N. E. M. A. standards.

Motor shall be equal in quality and performance to those manufactured by General Electric Company, Westinghouse Electric Company, or Allis Chalmers Company.

Motor shall be provided with a manually operated speed controller, resisters for 50 percent speed reduction and "start" and "stop" push button switch in cover. Controller shall be a single, self-contained unit mounted on a self-supporting steel frame and shall be equal in quality and performance to G. E. Control CR-126.

4.97 Metal Specifications: All iron castings shall comply with the specifications for Gray Iron, of the American Society for Testing Materials, Serial Designation A-48-29. All castings shall be true to pattern and shall not vary

more than 1/16 of an inch from the dimensions shown on the drawings. All castings shall be free from injurious blow-holes or other defects which would impair their strength or suitability for the work herein specified.

All steel castings shall conform to the specifications of the American Society for Testing Materials, Serial Designation A-27-24.

All structural steel shall conform to the specifications for structural steel of the American Society for Testing Materials, Serial Designation A-9-29.

All wrought iron shall conform to the specifications of the American Society for Testing Materials, Serial Designation A-41-30.

Wrought iron pipe shall conform to American Society for Testing Materials, Serial Designation A-72-30.

4.98 Painting: All castings shall be inspected and approved by the Engineer before painting, and in no case shall paint be applied until all surfaces are properly trimmed and thoroughly cleaned. All structural steel work shall be given one coat of heat resisting prime before leaving the shop and all exposed metal work shall be given two coats of heat resisting paint after erection, of a color approved by the Engineer.

Paint shall be heat resisting aluminum paint as manufactured by Perry Derrick Company, or equal.

4.99 Brick Materials and Workmanship:

5.00 Fire Brick: All fire brick for furnace chamber, combustion chamber, flues and chimney target wall shall be first quality coarse texture fire brick as manufactured by reputable and approved manufacturers. All fire brick shall be true to size and shape within the standard tolerance of the A. R. I.

The Contractor shall furnish certified copies of tests to verify the fact that the brick which he proposes to furnish will meet the above requirements.

5.01 Fire Clay: All fire clay shall be first quality fire clay finely ground and blended from the same source as the fire brick.

5.02 Insulation: All insulation shall be of the solid type and equal in quality and performance to "Sil-O-Cel C22" as manufactured by Johns-Manville Company, or "Armstrong H16-20" as manufactured by Armstrong Cork Company.

5.03 Common Brick: All common brick shall be first quality clay or shale brick of uniform texture, burned thoroughly.

5.04 Common Brick Mortar: Common brick mortar shall be cement, lime, sand mortar consisting of one part Portland cement, one part unslacked lime and six parts sand, by volume. "Brixment", "Magnolia Cement", "Bessemer Mortar Cement" or other standard brands of prepared mortars, mixed in the proportions recommended by the manufacturers may be used in lieu of the above mix.

5.05 Flat Suspended Arches: Flat suspended arches shall be equal in quality and performance to those manufactured by M. H. Detrick Company, the Laclede-Christy Company. The American Arch Company, or approved equal. Refractories for flat arches shall be equal to those specified for general use in the furnaces and shall be subjected to the same tests. All tiles for the flat suspended roofs shall be individually supported.

5.06 Workmanship: Fireclay shall be used for laying of all fire brick in walls and roofs. All firing door jambs and arches shall be laid up with an air setting high temperature cement equal to Lavino Company's "Wet Chrome" brand.

All straight fire brick in the walls shall be laid in headers with every joint broken and with the closest possible joints.

All fire brick shall be dry when used. Brick shall be sorted and matched on the job to obtain the closest possible uniformity in size of all brick in the same course. Mortar shall fill only the irregularities in the surface of the brick.

The fire clay mortar shall be used in a creamy state of consistency.

All brick courses shall be carefully laid to a line so that all horizontal joints for the full length of the wall will be level. All arches over doors or

other openings shall be built upon properly constructed skew backs and wood forms furnished and erected by the contractor, or fire brick arch blocks may be used as approved. Where doors or other openings in walls enter fire brick linings, shale brick in bottom, sides and top of these openings shall be protected with fire brick right through to door or other metal frames.

Expansion joints shall be built into the fire brick work in sufficient number to prevent warping and bulging due to expansion.

Flat arches shall be provided with expansion space around the sides and ends at the wall contacts.

Arch blocks in flat arches shall be so set as to provide contact of all surfaces. All arches shall be washed on the inside face with high temperature cement.

Insulating material shall be laid in bond with the prescribed type of mortar.

Floors of combustion chambers and flues shall be paved with fire brick laid in bond on edge.

5.07 Instruments:

5.08 Pyrometers: There shall be installed a two record recording pyrometer reading from 0 degrees F to 2400 degrees F for the furnace. The instrument shall be back connected and mounted on a steel or slate panel hung on the wall. Connecting wiring to the thermocouples shall be in conduits. The instrument shall register the temperatures in the combustion chamber and in the preheated air ducts. These instruments shall be Brown Instrument Company or approved equal. An indicating pyrometer shall also be mounted on the front of the furnace.

5.09 Thermocouples: The thermocouples in both the combustion chambers and in the preheated air ducts shall be base metal. The location, size, and type of protecting tubes of the Thermocouples are to conform to the type of furnace installed.

5.10 Supplies: A supply of charts and ribbons for one year shall be included with the instrument.

CHIMNEY

5.11 Work Included: The contractor shall furnish all the material for and construct a brick chimney and foundation, as specified herein, complete in all respects.

The chimney shall be 100 feet high above the mean level of the grates and shall be 5 feet inside diameter at the top. The chimney shall be built by a builder of established reputation and shall be equal in quality and performance to chimneys built by Rust Engineering Company, Alphons Custodis Chimney Construction Company, or M. W. Kellogg Company.

The column shall be built true to taper and plumb to center throughout.

5.12 Brick Material: All materials furnished shall be as specified in the following sections:

The radial brick shall be manufactured from refractory clay, moulded hollow with a multiplicity of vertical perforations, which perforations shall have a total area of not more than 30 percent of the gross cross-sectional area of the brick.

Brick shall be red in color and samples of brick shall be submitted to the Engineer and his approval obtained before any brick is delivered to the site.

The faces of all radial brick forming the external surface of the chimney shall be smooth, sound, uniform in color and texture, true to shape, free from cracks and checks throughout and evenly burned.

All radial brick shall have an absorption of not more than 12 percent after being immersed in water at 100 degrees C. for a period of 24 hours. All radial brick shall have a crushing strength of not less than 5,000 pounds per square inch of net section.

All fire brick furnished for use in constructing the main lining of the

chimney shall meet the following specifications:

1. All fire brick shall be of low duty quality (A.S.T.M. definition C-29-28) of uniform texture (Physical and mechanical features.)

2. All fire brick shall be true to shape and of uniform size and within standard A. R. I. tolerances.

3. All fire brick shall have a pyrometric cone equivalent 19 (temperature of 2768 degrees F. according to the 1926 Scale Fairchild and Peters.)

5.13 Mortar: All radial brick work shall be laid in lime, cement mortar consisting of Portland Cement, fresh burned lump lime, thoroughly slacked, and clean, sharp sand, free from vegetable matter, loam and other impurities. The proportions shall be one part cement, two parts lime and five parts sand by volume. After the lime is thoroughly slacked the sand shall be cut through the lime paste. Cement shall be added to the lime paste as the mortar is needed. No mortar shall be used after having taken an initial set and no retempering will be permitted.

All fire brick shall be laid up in first quality fire clay or fire clay and Portland cement according to the builder's standard practice.

5.14 Design: The chimney shall be designed using the following units:

Wind pressure - 25 pounds per square foot of projected area, with .8 factor for the round column section.

Tension - not to exceed 2 tons per square foot in any section of the chimney.

Compression - 15 tons per square foot in any section.

Minimum thickness of top of wall - 7 inches.

Weight brick - 120 pounds per cubic foot.

5.15 Radial Brick: The exterior of the chimney shaft shall be constructed of radial brick in accordance with the design units specified above.

All radial brick shall be laid in full bed of mortar using sufficient

material to force the mortar approximately 1/2 inch into the perforations. The radial brick work shall be bonded every third course. All outside joints shall be neatly struck. All vertical radial joints of each course making up the thickness of the chimney shall be broken with respect to the vertical radial joints in the same course immediately above and below and the vertical radial joints of adjacent courses at the same elvations shall stagger with each other.

5.16 Cornices: All caps, cornices, plinths or other variations from plain brick work shall be in addition to the thickness required to give stability to the structure.

5.17 Firebrick Linings: The interior chimney shaft shall be lined from the foundation to the top of the chimney with a self-supporting fire brick lining of minimum thickness proportioned as follows:

Top 35'0" - 4½" thick
Next 40' 0"- 6" "
Balance - 9" "

The walls over 6" in thickness shall be constructed of keys and circles bonding every course. The lining shall be laid in fire brick mortar as specified in Item 2 and shall have a minimum air space between lining and outside shell of 4 inches.

A target wall of first grade fire brick 4½" thick shall be carried up independently inside of the main lining for a height of not less than 12 feet above the main flue opening. All fire brick shall be dipped and hammered to a tight bed joint and tight cross joints. No buttered joints will be permitted.

The lining shall be smooth inside and shall be plumb from top to bottom.

All inside steel ladders used in the construction of the shell of the chimney shall be cut off at the outer shell so that no contact will exist between the outer shell and lining of the chimney.

5.18 Steel Corset and Bands: On the outside of the chimney lining the Contractor shall furnish and place a steel corset for the entire height of the

chimney. This corset shall consist of steel bands 3 inches in width by 3/8 inch, spaced 3 feet (average) on centers vertically and 3 feet on centers horizontally. All joints shall be so constructed that both the vertical bars and horizontal bars will fit tight against the brick work. No filling between the brick work and the bands with fire brick mortar or other materials will be permitted. Provision for off-setting the bands where the thicknesses of walls change shall be submitted to the Engineer for his approval. All bands shall be welded together. If bolted, one bolt 3/4 of an inch in diameter with head countersunk shall be used at each intersection and three 3/4" bolts, with heads countersunk shall be used at each splice. The contractor shall furnish and place steel bands 3 inches x 3/8 inch in thickness on 6 foot centers in the outside shell of the chimney. These steel bands shall be thoroughly bolted with at least three 3/4 inch bolts and shall have holes punched through centers of the band approximately 3 foot centers through which 1/4 inch pins shall be inserted to support the band in the brick work. The bands shall be placed so that one half of the band is in the lower and one half in the upper layer of the brick.

5.19 Flue Opening: Flue opening shall be of the size required by the furnace manufacturer, shall be lined with fire brick and shall be covered with fire brick arches.

5.20 Vent Holes: Vent holes shall be provided at the base of the chimney to ventilate the air space between the column and the lining.

5.21 Cap: The contractor shall furnish and erect at the top of the chimney and lining a cast iron cap to cover the fire brick, air space and outer wall. The caps shall be securely connected to the lightning protection system. The sections of the cap shall be securely bolted together.

5.22 Ladder: The chimney shall be provided with one ladder reaching from a point ten (10) feet above the ground to the top of the chimney. The ladder shall consist of 3/4 inch round genuine galvanized wrought iron rungs built into the wall at intervals not over 16 inches apart. All ladders shall be

true to line.

5.23 Lightning Rod: The contractor shall furnish and erect in position on the chimney two stranded copper cables, 180 degrees apart not less than 1/2 inch in diameter and circuit cable at top, together with all the necessary copper braces and clamps for gripping and holding the cables in position. Each cable shall be soldered to large heavy copper plate buried in the moist ground at least five feet distance from the base of the chimney or other structures and at least ten feet below the surface of the ground. The air conductors shall consist of solid copper rods 3/4 inch in diameter, spaced equidistant around the periphery of the top of the chimney at not over 8' 0" centers, but in no case shall there be less than three. These rods shall have their upper ends pointed and tipped with platinum and shall project a minimum distance of 2'6" above the top of the chimney.

5.24 Foundation: The chimney shall be constructed on reinforced concrete foundations designed for a soil bearing value of 4000 pounds per square foot. Specifications for other concrete work in and about the building shall apply in full to chimney foundations.

5.25 Cleanout Door: A standard size cast iron cleanout door shall be provided in the stack at ground level.

GUARANTEES AND TESTS

5.26 Guarantees: The contractor makes the following guarantees as part of his contracts.

The contractor guarantees that the furnace will incinerate combined garbage and rubbish, having the characteristics as to kind of material and moisture content herein specified, at a rate of burning equal to or greater than the normal rated capacity specified, and that this will be done without the addition of any auxiliary fuel.

The contractor guarantees that the plant will accomplish the above requirements without any objectionable odors or dust being discharged from the chimney.

The contractor guarantees that the plant will discharge no smoke during normal operation of a degree of density or darkness greater than Ringleman's Smoke Scale No. 1. The contractor guarantees that at no time during the normal operation of the furnaces will the temperature in the combustion chambers, and as ascertained from a continuous record, during the time of testing, fall below 1200° F. for more than three (3) minutes in any one hour, and that an average temperature therein of at least 1400° will be maintained.

The contractor guarantees that all residue from the furnace will be reduced to a nuisance free ash practically without organic matter.

The contractor guarantees the chimney for a period of one year against any and/or all defects resulting from the effects of wind not exceeding 100 miles per hour and the usual products of refuse combustion with temperatures not exceeding 1800° F.

The contractor guarantees that the average temperature of the preheated air will be not less than 350° F. during normal operation.

The contractor for the work herein specified, in consideration of the price bid and received therefor, guarantees that all workmanship and material furnished under these specifications are in all respects first class and of such kind and quality that the improvement will remain in good condition for and during the entire period of one (1) year from and after the date of the acceptance of the plant by the City. Normal wear and tear or damage due to improper operation excepted.

5.27 Tests: Tests to determine the capability of the furnaces shall be made by the contractor under the direction of the Engineer, and these tests shall be the tests upon which the guarantees, as required, are complied with. The test shall be run over an eight hour period.

BUILDING

5.28 General: The building shall be of such dimensions as to completely house the furnace, or furnaces, together with all appurtenances, with the exception

of the chimney and its connecting flue, and shall provide the clearances as called for under Maximums and Minimums, Paragraph 4.51. The building shall be of fireproof construction throughout.

The general layout sketch attached hereto indicates, in general, the location of the plant and the driveways necessary for ingress and engress.

This location and the arrangement of driveways should not be considered by the Contractor as being definitely fixed. Any other location on the property near the river will be considered or any other arrangement of driveways which will increase the efficiency of the plant the Contractor proposes to install will receive consideration.

5.29 Excavation: All excavations shall be carried to the grades as shown on the contract drawings. The excavation shall include the removal, handling, rehandling, backfilling and disposal of any and all materials encountered within the limits of the work, and shall include all pumping, draining, sheeting and shoring, backfilling or refilling and the protection thereof. Surplus material, after completion of backfilling or refilling shall be used in constructing driveways and approaches.

The Contractor shall satisfy himself by an examination of the site as to the amounts and kinds of material to be moved.

5.30 Grading: The Contractor shall grade the roadways and slopes approximately as shown on plans. Road surfacing is not included in this contract.

5.31 Backfilling: As various parts of the structure are completed, the Contractor shall refill the space outside and around the walls. This backfilling shall be carried to such an elevation that when settlement has occurred, the final finished grade which is required will obtain. All materials used for backfilling shall be free from perishable and objectionable material.

5.32 Footings and Foundations: All footings under walls, columns, chimney, etc. shall be spread footings designed and dimensioned to transmit to the soil loads not exceeding 4000 pounds per square foot. Concrete walls shall extend

up to a point at least six (6) inches above the finished grade. All walls in contact with earth shall be of concrete.

5.33 Foundation bolts and sleeves: All anchor bolts in foundations for building or furnaces shall be set by the contractor for the building with sleeves of sufficient size to allow a certain amount of freedom of movement for the bolts after the concrete has set. The building contractor shall also set any imbedded frames around the charging openings.

5.34 Concrete: All reinforced concrete shall be class A. All foundations not reinforced shall be Class B.

5.35 Unit Stresses: All reinforced concrete shall be designed for working stress in steel not to exceed 16,000 pounds per square inch in tension and in concrete not to exceed 650 pounds per square inch in compression.

BRICKWORK

5.36 Brick: All brick used in the work shall be first quality common shale brick, hard, sound and well burned throughout, of uniform texture, size and color, with straight unchipped edges. Soft or Ssalmon brick shall not be used in any part of the work.

5.37 Mortar: Mortar for brick masonry shall consist of one (1) part Portland cement, three (3) parts clean river sand, with an approved brand of hydrated lime added in amount not to exceed 10% of the amount of cement. Sand and cement shall be as specified in Paragraph 4-6-4 of these specifications.

In preparing mortar, the sand, cement and other ingredients shall be thoroughly mixed before the addition of water, and after sufficient water has been added the mortar shall again be mixed to bring it to a uniform consistency and color. No mortar shall be used which has attained an initial set, and no retempering of mortar will be permitted.

"Brixment" "Magnolia Cement","Bessemer Mortar Cement", or other approved brands of prepared mortar cement, mixed in the proportions recommended by the manufacturers, may be used in lieu of the above mix.

5.38 Laying: First-class brick laying will be vigorously insisted upon throughout the construction, and this shall be of the best quality known to the trade.

Each brick shall be laid in a full, close joint, of not over 1/2" thick mortar, on its bed and sides in one operation; throughout the construction, mortar joints shall be spread flat and bricks shall not be buttered. Every joint shall be completely filled with mortar. All courses of brick shall be kept truly level and the alignment of the vertical joints shall be kept true and the walls carried up plumb in level courses. Chipped or defective bricks or those showing any unsightly cracks or misshapen in form shall be rejected. All bricks shall be thoroughly wetted before laying in cold weather, and no brickwork shall be done contrary to the provisions of the specifications covering brick work in cold weather, as outlined below.

In laying 17" walls the inner joints of header courses from the exterior and interior faces where they abut, shall be covered with another interior header course which shall break joints with the courses below. In the construction of 13" and 17" walls and all brickwork, at least every sixth course of the wall construction shall have full headers.

Build in all openings, chases, ducts, anchors, pipes, etc., where required.

Build in all small detached lintels and plates where required.

5.39 Laying in cold weather: The contractor shall take all measures for protecting the work during cold weather, as are necessary.

Temperatures below 40° F. shall be considered as cold weather conditions necessitating special precautions to be taken when laying brick. Under such conditions provisions shall be made for covering the work and providing sufficient heat to maintain a temperature around the brickwork which shall be at all times in excess of 40° F.

All brickwork damaged by weather conditions or not properly laid as specified shall be removed and replaced by the contractor, when directed by the Engineer.

5.40 Protection: All finished work shall be protected from injury of all kinds, and damaged work shall be made good by the contractor. Immediately after completion of any portion of the wall, the top shall be protected throughout by tarpaulins or other means which will prevent the entrance of moisture in the event of rainfall. All new work shall be kept moist in warm weather until mortar has hardened so as to prevent cracking of the mortar or other injurious effects resulting from too rapid drying.

5.41 Cleaning: After the completion of the brickwork and after the construction of any adjacent or overlying work which may cause the brickwork to be soiled, all exposed brick surfaces, both inside and outside, shall be cleaned in a workmanlike manner. This cleaning shall be prosecuted until all surfaces are uniform in appearance, using wire brushes and a solution of muriatic acid in water as approved by the Engineer.

STRUCTURAL STEEL

5.42 The contractor shall furnish and erect all structural steel necessary for the building. All lintels shall be designed to carry all dead and live loads above the full opening.

Structural steel shapes and plates shall comply with the latest standard specifications of the American Society for Testing Materials. Design and details shall meet the latest standard of the American Institute of Steel Construction as to loads and stresses. Workmanship shall be first class in every respect. Floor beams shall, unless otherwise specified, be protected by not less than 2" of concrete over wire mesh.

Shop rivets shall be as approved on the detail drawings, but welding may be used instead of shop riveting. Field connections may be made with bolts. Holes may be punched full size. Bearing plates shall be set accurately in place, on a layer of 1:2 cement mortar and anchor bolts shall be thoroughly grouted in place. Steel work shall be given one coat of red lead and oil in shop, before shipment. Field paint to be as specified below.

WALLS

5.43 All outside walls above concrete footings, except those which are in contact with earth, shall be constructed of brick, of the quality and in the manner above specified.

All walls up to the charging floor level shall be not less than 17 inches in thickness for pilasters and 12 inches in thickness for panel walls. Walls above the charging floor level shall be not less than 8 inches in thickness with 12" pilasters where required.

Parapet walls shall be 8 inches in thickness and shall have a concrete coping 10 inches wide by 4 inches thick. Parapet wall shall be not less than 2 feet in height above the roof at any point.

Partition walls inside the building shall be not less than 6" in thickness if constructed of building tile or not less than 8" thick if constructed of brick similar to that used in the building. All tile walls shall be plastered on both sides.

All walls which are in contact with earth shall be constructed of concrete. These walls shall be designed to withstand the thrust caused by the earth fill, as well as to support any superimposed dead and live loads.

FLOORS

5.44 All floors throughout the building shall be solid concrete slabs, and all floors shall be reinforced, including floors which are placed on the ground.

Floor slabs on the ground shall be not less than 8 inches in thickness when subject to the load of trucks, and elsewhere shall be not less than 5 inches in thickness at the thinnest point. All slabs on the ground shall be laid with 1/2" premoulded asphaltum expansion joint separating the slab on all sides from furnace and building walls.

All other concrete slabs that are supported on beams shall be of the thickness and design required to support the following live loads, in addition to the dead load of the slab.

Floors subject to the load of trucks - 300 lbs. per sq. foot.

All other floors - 125 lbs. per sq. foot.

All roofs - not less than - 30 lbs. per sq. foot.

5.45 Roof: Roof may be of either flat or pitched design. Roof shall be of fireproof construction.

5.46 Flat Roof Slabs: The roof deck may be either monocast concrete or precast concrete slabs, supported by steel trusses or beams, and steel channel or I-beam purlins, bolted to the upper chord of trusses or to the beams, properly braced and tied. Roof shall be pitched not less than 3/8" per foot of slope.

If deck is constructed of monocast concrete it shall be designed for the live load given above and constructed in accordance with specifications covering concrete.

If deck is constructed of precast concrete slabs they shall be of the light weight or sand cast type as manufactured by the Federal American Coment Tile Company or equal, properly reinforced to sustain the specified loading.

5.47 Built up roofing: Flat roof deck shall be covered with built-up roofing. The built-up roofing shall be 4-ply asbestos composition roofing as manufactured by the Barrett Company, or the Koppers Products Company, or equal. Roofing shall be laid in accordance with manufacturer's specifications for use over monocast or precast concrete slabs. The roofing shall be placed by an approved roofing contractor, and he shall furnish the manufacturer's Surety Bond Guarantee for not less than ten years.

5.48 Flashing: The contractor shall install all sheet metal work of a miscellaneous nature necessary for flashing and counter flashing, bending and forming same to shapes and sizes required to make a first-class installation.

All flashings shall be of the best grade of copper sheets of sizes necessary for the character of the work. All copper throughout the work shall weigh one pound (16 ounces) per square foot, and shall be of soft (roofing temper) sheets, plainly marked with the name of the manufacturer and weight.

PITCHED ROOF

5.49 Tile: If roof is of the pitched design, it shall be constructed of interlocking precast concrete roofing tile as manufactured by the Federal American Cement Tile Company, or equal, supported as specified for Flat Roof. Roof shall be finished with special tile at ridges, gables and eaves. Roof shall be laid in accordance with the manufacturer's standard practice or specifications.

The roof pitch shall not be less than one-fifth.

5.50 Gutters and Downspouts: Suitable gutters and downspouts shall be provided for pitched roofs. Gutters shall be provided along all eaves of pitched type roof. Gutters and downspouts shall be copper not less than 16 ounce or #20 gauge galvanized Armco Iron or equal. Roof drains shall be provided in flat type roof. Downspouts from flat roof drains shall be of cast iron soil pipe and shall be located on the inside of the building. All downspouts shall discharge at ground level, unless otherwise shown.

5.51 Ventilators: The roof above the charging floor shall be equipped with ventilators, one being located over each furnace. Ventilators shall be 30 inches in diameter, and shall be constructed of 18 gauge galvanized ingot iron. They shall be operated from the charging floor by means of chains. Ventilators shall be equal in quality and design to those manufactured by the Burt Manufacturing Company, Robertson or equal.

5.52 Steel Sash: All window sash shall be of standard design as manufactured by the Truscon Steel Company, Fenestra Company, or an approved equal. All sash bars shall be made of solid rolled steel sections. Ventilators in the sash, where shown, shall be horizontally pivoted. Continuous two-point flat contact weathering shall be used on all sides of the ventilators. The butts shall be of solid hot rolled steel, securely riveted, through the sash bars and the weathering. All sash and ventilators shall be weather tight. Solid rolled steel T-bar mullions shall be used between sash units, of proper size and type for the length of the mullion in question.

There shall be suitable means provided for holding the ventilators both in the closed and open position. Windows shall be so located that ventilators may be reached by a man standing on the floor or other easily accessible points.

The sash shall be set directly into the masonry, and the sash manufacturer shall furnish angle pins around the head, jambs and sills. All windows shall be properly aligned and shall be set plumb and true and securely anchored before glazing.

5.53 Glazing: The contractor shall furnish all the material for and glaze the various windows and doors necessary to make the work complete in all respects.

All windows shall be glazed with 1/8 inch factory ribbed glass. All doors shall be glazed with 1/4" ribbed wire glass. Openings shall be glazed with the best quality of steel glazing putty. The lights being set in a full bed of putty all around.

The contractor shall protect the glass during erection and maintain until the contract is completed. At completion, the contractor shall clean the glass of oil or other adhering materials, including labels, paint, varnish, etc.

5.54 Rolling Steel Doors: All doors through which trucks are to pass shall be hand operated, rolling steel type service doors, face mounting, as manufactured by the Kinnear Manufacturing Company, the J. G. Wilson Corporation, or equal. The curtain shall be of interlocking rolled slats, U. S. No. 20 gauge open hearth steel, of sufficient strength to withstand a wind load of 20 pounds per square foot. All parts to be hot galvanized with a high grade of pure zinc coating. Curtain to be counter-balanced to permit easy operation. The curtain coil to be housed in a hood of U. S. No. 24 galvanized steel. Guides to be built of structural steel with slots of sufficient depth to keep the curtain in place without the use of windlocks.

5.55 Metal Doors: All doors throughout the building (other than rolling steel doors) shall be light industrial steel doors as manufactured by the Truscon Steel Company or equal. They shall be not less than 1-3/4" in thickness and made of 14 gauge steel with all welded joints.

The minimum size of all outside entrance doors shall be 3' 0" x 7' 0".

The door frames shall be of No. 14 gauge steel formed into special channels 4-3/16" x 2-1/8" with integral rebate and stops. The frames shall have masonry anchors on about 18" centers for each joint.

5.56 Hardware: Each door leaf shall have at least three (3) half surface template loose pin sherardized steel butts securely attached to the leaf and the frame.

Exterior doors shall be equipped with a mortise cylinder lock having bronze knobs or lever handles.

Interior doors shall be equipped with standard lever latch for closing.

5.57 Stairways: Stairways shall be constructed of reinforced concrete or of structural steel or cast iron.

The clear width of all stairways shall be not less than 2' 9".

The nominal tread of all stairs shall be not less than 10 inches and the risers shall be of such height that the sum of the tread and riser shall not exceed 18 inches.

Hand rails shall be of 1-1/4 inch galvanized pipe. Hand rail shall be provided on open sides of stairways and around well openings and shall be constructed of two pipe rails with stanchions securely set in pipe sleeves in the concrete stairs or attached with bolts to steel stringers or beams of steel stairs. The vertical height of the rail above the floor or tread shall not be less than 3' 0".

5.58 Miscellaneous iron: Around all openings and on top of all walls requiring same, proper railings shall be provided, constructed as called for under stairways.

All doorways through which trucks pass shall be provided with cast iron or welded steel wheel guards of approved design.

5.59 Waterproofing: All concrete walls in contact with earth, above the

stoking floor, shall be waterproofed on the outside with not less than two coats of approved asphaltic application, applied hot.

5.60 Painting: All exposed metal work, including doors and sash, shall be given two coats of paint, of an approved color and brand, in the field after erection.

5.61 Toilet and Locker Room: A combined toilet and locker room shall be provided and equipped substantially as herein described.

Contractor shall provide and install ready for use the following:

Six steel lockers of standard Lyon Metal Products Company, or equal, finished in green, on legs, with shelf in top and hooks below, size 1'3" x 1'3" x 6' 0" high.

One (1) vitreous china syphon action elongated closet with jet, floor outlet, fitted with Sloan Royal or equal chromium plated flush valve with one (1) loose key stop to wall, metal oscillating handle, one and one-half (1 1/2") inch flush connection to back spud of bowl, No. 2500 Church Sani-Black or equal front coverless seat with black moulded check hinge.

One (1) rough chrome plated industrial shower with cast brass shower head and galvanized goose neck riser.

Shower enclosure to be of slate panels 6 ft. 6 inches high. Opening to be fitted with chromium plated rod for curtain. Curtain to be mildew proof and water repellant.

One (1) twenty (20) inch by eighteen (18) inch vitreous china bowl lavatory with open overflow and supported on wall hangers.

5.62 Plumbing: The contractor shall furnish all labor and materials and properly install all plumbing as called for and as specified herein or as necessary to make the work complete in all respects. All plumbing shall meet the requirements of the building code governing the same.

A 150-gallon hot water tank suitable for 125# pressure, shall be provided, equipped with an approved safety valve, and connected to a return bend wrought

iron coil, 1 1/4" diameter, located within the combustion chamber or flue of the furnace. Proper connection shall be made for conveying the water from the tank to the shower and lavatory in the toilet room.

Suitable and adequate floor drain shall be provided on both the charging and stoking floors. All floor drains shall have 4 inch or larger outlets and shall be adequately protected where passed over by trucks.

At least one (1) inch hose connection to the cold water line shall be provided on each floor. These hose connections shall be mounted 3 feet above the floor and suitably anchored to the wall.

All piping shall be supported on substantial, adjustable hangers, spaced not more than ten (10) feet apart. All pipes passing through walls, floors or partitions shall have galvanized iron collars or sleeves.

The contractor shall extend the water and sewer lines to points shown on plans and shall connect to the City water lines and sanitary sewers.

5.63 Cast Iron Soil Pipe: All cast iron soil pipes, traps, fittings, etc., under ground shall be "extra heavy"; all above ground "medium". They shall be factory tested, free from sand holes, splits and other defects, and of uniform weight and thickness and coated with asphaltum inside and outside. Joints shall be first caulked with oakem, then filled flush with the hub with pure pig lead.

5.64 Water Pipe: All water piping throughout the work shall be copper type K with "Stream line" joints.

The contractor shall run one inch service pipe and connect to the main on College Street.

5.65 Valves: All valves shall be Scott, or equal, of cast brass, and of the full sizes of the pipes they control.

5.66 Vent Pipes: Pipe stacks shall be of 4 inch "medium" weight, soil pipe carried up full size through the building and above the roof.

Pipe stacks shall be firmly supported at the base on masonry or in other approved manner, and anchored to walls at least once in each ten feet of vertical height.

5.67 Sewer: The Contractor shall construct the sanitary 8" sewer from the plant to the manhole on College Street.

5.68 Electrical Work: The contractor shall furnish and install all electrical wiring fixtures and appurtenances required to properly illuminate the building and to operate all equipment requiring electrical power.

The work shall include connections to the service brought to the building wall by the owner, all conduits for carrying power and electric wiring throughout the building, all wiring in conduits for both lighting and power circuits all service outlets, all lighting fixtures and lights throughout the plant, and all other work necessary to make such equipment complete and ready for operation.

All work shall be installed in accordance with the provisions of the Electrical Code of the National Board of Underwriters, and the Electrical Code of the City of Athens.

All wiring shall be enclosed in conduits that shall be concealed in the floors or walls wherever practicable. Lines shall be of suitable capacity for the service intended.

The lights on each floor and in each auxiliary room of the building shall be controlled on independent circuits with control buttons located at convenient points.

The lighting shall be designed so as to give at all times an adequate lighting to all parts of the building in general use. All lighting fixtures shall be steel R. L. M. standard.

At least two service outlets, on opposite walls, shall be provided on each floor and not less than one service outlet in each separate room of the building. On each floor an extension light with at least 50 feet of protected cord and wire globe guard shall be provided.

The contractor shall furnish, install and completely wire, at a suitable location, a dead front, totally enclosed, steel switchboard for both power and

light. The forced draft fan motors shall be connected up by the contractor as well as any special motors.

Power will be supplied at the building by the owner at 220 volts 3 phase 60 cycles.

5.69 Truck Scale: The Contractor shall furnish and install one 15 ton capacity 18 x 9 truck scale equal to Fairbanks Morse and Company scale #12087, complete with steel for concrete deck and full capacity beam and metal office pillar outfit.

P R O P O S A L

TO THE MAYOR AND COUNCIL OF THE CITY OF ATHENS,

ATHENS, GEORGIA Submitted: _____ 1939

The undersigned, as Bidder, hereby declares that the only person or persons interested in the proposal as principal or principals is or are named herein and that no other person than herein mentioned is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the Contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Plans and Specifications for the work and contractual documents relative thereto, and has read all Special Provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if this proposal is accepted, to contract with the Mayor and Council of the City of Athens, Georgia, in the form of Contract specified, to furnish all necessary materials, equipment, machinery tools, apparatus, means of transportation and labor necessary to and to complete the Constructing of DIVISION No _____, in full and complete accordance with the shown, noted, described, and reasonably intended requirements of the Specifications and Contract Documents, to the full and entire satisfaction of the City of Athens, Georgia, with a definite understanding that no money will be allowed for extra work except as set forth in the

attached General Conditions and Contract Documents for the following prices:

DIVISION I

ITEM 1: For earth excavation for tank foundations - 350 cu. yds.

@ _____ Dollars,

$ _____ per cu. yd.

TOTAL _____ Dollars,

$ _____

ITEM 2: For concrete in Tank Foundations - 120 Cu. yds.

@ _____ Dollars,

$ _____ per cu. yd.

TOTAL _____ Dollars,

$ _____

ITEM 3: For reinforcing steel in place in tank foundations - 1000 lbs.

@ _____ cents

cents _____ per lb.

TOTAL _____ Dollars,

$ _____

ITEM 4: For furnishing and installing cast iron pipe and fittings for connection to tank.

130 ft. 12" @ _____ Dollars,

$ _____ per ft.

TOTAL _____

110 ft. 6" @ _____ Dollars,

$ _____ per ft.

TOTAL _____

54 ft. 4" @ _____ Dollars,

$ _____ per ft.

TOTAL _____

C. I. Specials:

1.0 Tons @ _____ Dollars,

$ _____ Per ton

TOTAL _____

TOTAL FOR ITEM 4: _____ Dollars,

$ _____

ITEM 4-A: For furnishing all materials and constructing manhole -

1 @ _____ Dollars,

$ _____

ITEM 4-B: For furnishing all materials and constructing 8" vitrified clay or concrete sewers -

60 ft. @ _____ Dollars,

$ _____ Per foot.

TOTAL _____ Dollars,

$ _____

ITEM 5. For furnishing and installing valves and hydrants.

One (1) Hydrant _____ Dollars,

$ _____

One (1) 6" Gate valve
and Valve Box _____ Dollars,

$ _____

One (1) 12" Gate Valve
and Valve Box _____ Dollars,

$ _____

TOTAL _____

ITEM 6. For furnishing and installing cone altitude valve including concrete pits complete as shown on plans and specified but not including furnishing cast iron fittings which are included in Item 4.

1 - 10" Valve at new Tank _____ Dollars,

$ _____

1 - 10" Valve at old Tank _____ Dollars,

$_____

TOTAL ITEMS I TO 6 INCLUSIVE _____

SEWER EXTENSIONS

ITEM 7. For furnishing all materials and labor and laying Vitrified Terra Cotta sewer pipe, including, backfilling complete as shown on plans and specified:

8" Pipe

0 - 4' deep 2,500 Ft @ $_____ per ft.

TOTAL _____

4 - 6' deep 12,300 Ft @ $_____ per ft.

TOTAL _____

6 - 8' deep 11,415 Ft @ $_____ per ft.

TOTAL _____

8 - 10' deep 2,700 Ft @ $_____ per ft.

TOTAL _____

10 - 12' deep 550 Ft @ $_____ per ft.

TOTAL _____

12 - 14' deep 200 Ft @ $_____ per ft.

TOTAL _____

14 - 16' deep 210 Ft @ $_____ per ft.

TOTAL _____

12" Pipe

0 - 4' deep 690 Ft @ $_____ per ft.

TOTAL _____

4 - 6' deep 2,750 Ft @ $_____ per ft.

TOTAL _____

6 - 8' deep 2,270 Ft @ $_____per ft.

TOTAL _____

8 - 10' deep 325 Ft @ $_____per ft.

TOTAL _____

10 - 12' deep 85 Ft @ $_____per ft.

TOTAL _____

12 - 14' deep 10 Ft @ $_____per ft.

TOTAL _____

14 - 16' deep 90 Ft @ $_____per ft.

TOTAL _____

TOTAL ITEM 7 _____DOLLARS

$_____

ITEM 8 For Vitrified Terra Cotta Y Branches

1100 8 x 4 Branches @ _____DOLLARS

$_____

TOTAL _____

170 12 x 4 Branches @ _____DOLLARS

$_____

TOTAL _____

TOTAL FOR ITEM 8 _____

ITEM 9 For furnishing all materials and labor and laying Concrete Sewer Pipe complete, backfilling etc. complete as shown on plans and specified:

8" Pipe

0 - 4' deep 2,500 ft @ $_____per ft.

TOTAL _____

4 - 6' deep 12,300 ft @ $_____per ft.

TOTAL _____

6 - 8' deep 11,415 foot @ $_____ per ft.

TOTAL _____

8 - 10' deep 2,700 foot @ $_____ per ft

TOTAL _____

10 - 12' deep 550 foot @ $_____ per ft

TOTAL _____

12 - 14' deep 200 foot @ $_____ per ft

TOTAL _____

14 - 16' deep 210 foot @ $_____ per ft

TOTAL _____

12" Pipe

0 - 4' deep 690 ft @ $_____ per ft

TOTAL _____

4 - 6' deep 2,750 ft @ $_____ per ft

TOTAL _____

6 - 8' deep 2,270 ft @ $_____ per ft

TOTAL _____

8 - 10' deep 325 ft @ $_____ per ft

TOTAL _____

10 - 12' deep 85 ft @ $_____ per ft

TOTAL _____

12 - 14' deep 10 ft @ $_____ per ft

TOTAL _____

14 - 16' deep 90 ft @ $_____ per ft

TOTAL _____

TOTAL FOR ITEM 9 _____ DOLLARS

$_____

ITEM 10 For Concrete Y Branches

1100 8 x 4 Branches @ $_____

TOTAL _____

170 12 x 4 Branches @ $_____

TOTAL _____

TOTAL FOR ITEM 10 _____ DOLLARS

$_____

ITEM 11 For brick manhole complete including Cast Iron Frame and Cover

9 0 - 4' deep _____ DOLLARS

$_____ Each

42 4 - 6' deep _____ DOLLARS

$_____ Each

26 6 - 8' deep _____ DOLLARS

$_____ Each

5 8 - 10' deep _____ DOLLARS

$_____ Each

3 10 - 12' deep _____ DOLLARS

$_____ Each

2 12 - 14' deep _____ DOLLARS

$_____ Each

1 14 - 16' deep _____ DOLLARS

$_____ Each

TOTAL FOR ITEM 11 _____ DOLLARS

$_____

ITEM 11-A: For drop Manholes complete, including cast iron frame and cover complete.

1 4 - 6' deep @ _____ DOLLARS

$_____ Each

1 6' - 8' deep @ _____ Dollars

$_____ Each

6 8' - 10' deep @ _____ Dollars

$_____ Each

4 10' - 12' deep @ _____ Dollars

$_____ Each

1 12' - 14' deep @ _____ Dollars

$_____ Each

TOTAL FOR ITEM 11-A _____ Dollars

$_____

ITEM 12: For furnishing all materials and constructing manually operated flush tanks but not including water connections.

2 0' - 4' deep @ _____ Dollars

$_____ Each

11 4' - 6' deep @ _____ Dollars

$_____ Each

8 6' - 8' deep @ _____ Dollars

$_____ Each

1 8' - 10' deep @ _____ Dollars

$_____ Each

TOTAL FOR ITEM 12 _____ Dollars

$_____

ITEM 13: For furnishing all materials and laying cast iron pipe sewers:

8" Pipe

200 ft. - 0' - 4' deep @ _____ Dollars

$_____ per ft.

TOTAL _____ Dollars

$_____

30 ft. - 4' - 6' deep @ _____ Dollars,

$ _____ per foot.

TOTAL _____ Dollars,

$ _____

12 inch pipe

15 ft. - 6 - 8' deep @ _____ Dollars,

$ _____ per foot.

50 ft. - 8' - 10' deep @ _____ Dollars,

$ _____ per foot.

20 ft. -10'-12' deep @ _____ Dollars,

$ _____ per foot.

25 ft. -12' - 14 deep @ _____ Dollars,

$ _____ per foot.

20 ft. -14'-16' deep @ _____ Dollars,

$ _____ per foot.

TOTAL ITEM 13 _____ Dollars,

$ _____

ITEM 14: For rock excavation in trenches -

36,000 Units @ _____ Cents per unit

TOTAL _____ Dollars,

$ _____

ITEM 15: For concrete in piers for pipe supports -

10 cu. yds. @ _____ Dollars,

$ _____ Per cu. yard.

TOTAL _____ Dollars,

$ _____

ITEM 16: For furnishing and installing water connections for flush tanks -

500 feet, 1 inch type K copper pipe @ _____ Per foot

TOTAL _____ Dollars

$

Corporation Cocks and Valves and fittings for each connection installed -

22 @ _____ Dollars,

TOTAL _____ Dollars.

TOTAL FOR ITEM 16 _____ Dollars,

$ _____

ITEM 17: For trench sheathing ordered left in place -

$ _____ Dollars,

$ _____ Per M.

ITEM 18: For lumber used for pipe foundation -

_____ Dollars,

$ _____ Per M.

TOTAL FOR DIVISION 1, USING CONCRETE SEWER PIPE -

_____ Dollars,

$ _____

TOTAL FOR DIVISION 1, USING VITRIFIED CLAY SEWER PIPE -

_____ Dollars,

$ _____

DIVISION II

ELEVATED TANK

ITEM 19: For furnishing all materials and erecting elevated tank complete as specified on foundations furnished by others.

_____ DOLLARS,

$ _____

Deductive Alternate No. 1.

If three coats of red lead and oil are substituted for the bituminous coating specified for the interior of the tank deduct

_____ Dollars,

NOTE: This alternate will not be used unless the price bid under ITEM 19 exceeds the funds allocated for the tank.

DIVISION III

ITEM 20: For furnishing all materials and labor for the construction of a refuse incinerator as specified,

the sum of _____ Dollars,

$ _____

The Bidder further proposes and agrees hereby to commence work under his contract on a date to be specified in a written order of the Engineer, and shall fully complete all work thereunder within _____ consecutive calendar days from and including said date.

The undersigned further agrees that, in case of failure on his part to execute the said Contract and the bond within ten (10) consecutive calendar days after written notice being given of the award of the Contract, the check or Bid Bond accompanying this bid, and the monies payable thereon, shall be paid into the funds of the City of Athens, Georgia, as liquidated damages for such failure; otherwise, the check or Bid Bond accompanying this proposal shall be returned to the undersigned.

Attached hereto is a certified check on the _____ Bank of _____ or a Bid Bond for the sum of _____ DOLLARS, ($_____) made payable to the Mayor and Council of the City of Athens, Georgia.

_____ L.S.

_____ L.S.

_____ L.S.

(Note: If the Bidder is a corporation, the proposal shall be signed by an officer of the corporation; if a partnership, it shall be signed by a partner. If signed by others, authority for signature shall be attached)

ADDRESS:

_____

The full names and residences of persons and firms interested in the foregoing bid, as principals, are as follows:

_____

_____

_____

_____

CONSTRUCTION AGREEMENT

This agreement made and entered into on the _____day of _____, 1939, by and between _____party of the first part, and the _____party of the second part.

WITNESSETH:

That the first party, for the consideration hereinafter fully set out, hereby agrees with the second party as follows:

1. That the first party shall furnish all the materials and perform all of the work included in Division _____, in manner and form as provided by the following enumerated plans, specifications and documents, which are attached hereto and made a part hereof, as if fully contained herein; Advertisement for Bids; Section 1 - Instruction to Bidders; Section 2-General and Detailed Specifications; Accepted Proposal; together with all plans, drawings and addenda annexed hereto.

2. That the first party shall commence the work to be performed under this agreement on a date to be specified in a written order of the second party's Engineer, and shall fully complete all work hereunder within _____ _____consecutive calendar days from and including said date.

3. The second party hereby agrees to pay to the first party for the faithful performance of this Agreement, subject to additions and deductions as provided in the specifications or proposal, in lawful money of the United States, as follows: _____

_____

4. On or before the 15th day of each calendar month, the second party shall make partial payments to the first party on the basis of a duly certified and approved estimate of work performed and of material properly stored on the site of the project during the preceding calendar month by the first party, less ten per cent (10%) of the amount of such estimate which is to be retained by the second party until all work has been performed strictly in accordance with this agreement and until such work has been accepted by the second party.

5. Upon submission by the first party of evidence satisfactory to the second party that all payrolls, material bills and other cost incurred by the first party in connection with the construction of the work have been paid in full, final payment on account of this agreement shall be made within 30 days after the completion by the first party of all work covered by this agreement and the acceptance of such work by the second party.

6. It is further mutually agreed between the parties hereto that if, at any time after the execution of this agreement and the surety bond hereto attached for its faithful performance, the second party shall deem the surety or sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the work, the first party shall, at its expense, within five days after the receipt of notice from the second party so to do, furnish and additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the second party. In such event no further payment to the first party shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the second party.

IN WITNESS WHEREOF the parties hereto have executed this agreement on the day and date first above written in three (3) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original contract.

_____

_____

By_____

(SEAL)

Attest:

_____

_____

By_____

St. 1-C

CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ (hereinafter called the "Principal)

and _____ (hereinafter

called the "Surety") are held and firmly bound unto the _____,

Georgia (hereinafter called the "Owner"), for the use of the Owner and all persons doing work or furnishing skill, tools, machinery, supplies or materials under or for the purpose of the contract hereinafter referred to, in the full and just sum of _____ Dollars ($_____), lawful money of the United States of America to be paid to the Owner, its successors and assigns, to which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into contract with the Owner bearing date of _____, 193 , for construction of certain work upon certain terms and conditions, completely set out in said contract; and

WHEREAS, it was one of the conditions of the award by the Owner, pursuant to which the contract hereinabove referred to was entered into, that these presents shall be executed;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall in all respects fully comply with the terms and conditions of said contract and his obligations thereunder, including the specifications, proposals and plans therein referred to and made a part thereof, and such alterations as may be made on such plans and specifications as therein provided for, and shall indemnify and save harmless the Owner against or from all costs, expenses, damages, injury or loss, to which the Owner may be subjected by reason of any wrong doing, misconduct, want of care or skill, negligence, or default including patent infringement on the part of the Principal, his agents or employees,

in the execution or performance of said contract, and shall promptly pay all just claims for damages or injury to property and for all work done, or skill, tools, or machinery, supplies, labor and materials furnished and debts incurred by the Principal in or about the performance of the work contracted for, this obligation to be void.

And the surety, for value received, hereby stipulates and agrees that no change, extension of time, or alteration or addition to the terms of the contract or the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications. This bond shall be for the use of the Owner and all persons doing work or furnishing skill, tools, machinery or materials under or for the purposes of the contract hereinabove referred to.

IN TESTIMONY WHEREOF, the Principal and the Surety have caused these presents to be duly signed and sealed in _____ this _____ day of _____ 193 9.

Executed in three (3) counterparts.

_____

Witness: By _____

_____

_____ _____

By _____

Countersigned:

_____

Resident Agent

ATTORNEY'S OPINION AS TO LEGALITY
OF CONTRACT DOCUMENTS

This is to certify that I have examined the attached contract documents; that after such examination I am of the opinion that such documents conform to the laws of the State of Georgia; that the execution of the construction contract and the contract bond is in due and proper form; that the representatives of the respective contracting parties have full power and authority to execute such construction contract and contract bond on behalf of the respective contracting parties and that the foregoing agreements constitute valid and binding obligations on such parties.

_____

ATTORNEY FOR _____

This the _____ day of _____ 1939